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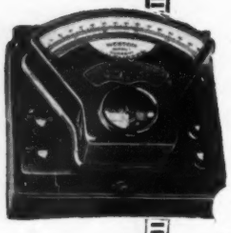

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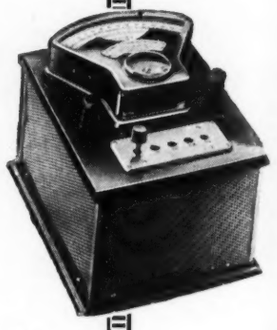

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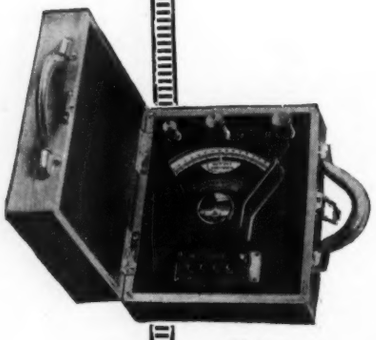

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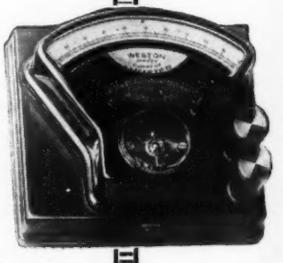

Weston Portable Ammeter

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Electrical World

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Merchandising Elements in Rates

DOMESTIC rates to be successful must be based on the uses of electricity in the home and bear little relation to the cost of production. The sale of energy to domestic customers is a merchandising function, and service is the chief sales consideration. From this standpoint domestic rates should be made after the light and power industry has established a merchandising policy. They should be developed from the commercial angle and not from the standpoint of cost accounting or investment allocations. They should be simple and should be based on the service uses.

This conception is a heresy to rate experts who have made and instituted multi-part rates in the utility business. Two-part and three-part charges are common, and the idea of rate makers has been to collect all fixed charges and all energy charges before they start to collect for service. Few, if any, other industries have made a success with such a merchandising policy.

A home owner uses electricity for lighting, for small appliances, for refrigeration and for cooking and heating. He thinks of electrical energy in terms of these services as measured in comfort and convenience. He cares little and understands less about demand charges, service charges, minimum charges, area charges or cents per kilowatt-hour. Merchandising to a home owner means telling him as a final step in the sale of electric service that this refrigerator or that range will cost so many cents a day or so many dollars a month. Service is "sold" to him; a domestic rate schedule is not. In any consideration of a national plan for more uniformity in domestic rate forms it would be highly desirable to bring merchandising policy to the attention of industry rate makers.

* * * *

Interlinking of Great Power Systems

COMPLETION of the Raleigh-Roanoke tie-in brings into being an interconnected system of tremendous possibility. For the present the tie-in is spectacular chiefly in that it links the great electric systems of the Southeast with those north of the Ohio River, but the transformer capacity at switching points limits its possibility. However, the future is exceedingly bright for such a superpower system, extending as it does from the Gulf of Mexico to the Great Lakes and tapping every great city and industry in that important area.

The principle of superpower development has for years been firmly established and accepted in the Southeast and in the North Central States. Naturally, as existing interconnection systems become augmented and their lines strengthened with time, the amount of electricity interchanged will grow proportionately greater and there will follow better co-ordination in the operation of the interconnected network. It must be apparent that so long as the systems affected by the present Raleigh-Roanoke tie-in, for example, are not intrusted to a single operator, owing to diversity of ownership, maximum development of such a system cannot be attained. Its importance, however, will in all likelihood quickly lead to some unity of action along operating lines. Consider the possibilities of the system: The wonderful coal resources of Pennsylvania, West Virginia and Illinois—the finest in the world—are linked with the water powers and coal fields of the southern Appalachian range.

The superpower system thus created involves the major electrical systems of Arkansas, Louisiana, Mississippi, Alabama, Tennessee, Georgia, South Carolina, North Carolina, Virginia, West Virginia, Ohio and Indiana, with the further possibilities of Pennsylvania, Illinois, Kentucky, Michigan and Wisconsin. As much as a million existing horsepower will be released for further use owing to the great diversity between the industries of the South and those of the North Central States as well as to the difference of an hour's time between the eastern and western portions of the system. The vast economy indicated by the Raleigh-Roanoke tie-in will without doubt become a matter of fact before many years. Hence the strategic significance of the line.

* * * *

The Manufacturers Go Adventuring in Friendship

ASSOCIATION ISLAND, up in Lake Ontario, has become the shrine of co-operation in the electrical industry. Maintained for fifteen years or more first by the lamp manufacturers and then by the General Electric Company as a summer camp for meetings, it has developed into an institution unique in American industry and has established a tradition of informality and comradeship that has borne rich fruit in terms of electrical progress. And now the executives of the manufacturing companies have invoked its good influence and gone adventuring in friendship by holding there last week a meeting of the Policy Division of the National Electrical Manufacturers' Association. It was in many ways the most interesting and the most encouraging gathering of our manufacturing industry yet recorded. For, after all, the simple bond of sympathetic understanding between men still remains the most stabilizing force in business. It is fundamental to the promotion of standardization, to the development of industry statistics, to the establishment of helpful trade policies and to the maintenance of the sound economics essential to prosperity. The cultivation of a closer personal contact between these executives is, therefore, important.

The electrical manufacturing industry is suffering today from overproduction in many lines. This has led to a very intense competition for existing business that too often is leading to costly sacrifices, the result of price cutting that is to the interest neither of the industry nor the public. The great need is for a more intelligent analysis of markets, a more accurate knowledge of the costs of manufacture and a more intensive development of sales, which can only be accomplished by co-operation. This applies equally to the fields of supplies, apparatus, appliances and radio, for which there are four N.E.M.A. divisions. Is is of more than passing interest, therefore, that the chief issue before this gathering of executives was the need for a broad industry sales program to provide a comprehensive plan for rewiring and equipping the homes of America for complete electric service. A committee is to be appointed at once to meet with delegations of the other branches of the industry in a joint sales conference.

This positive action is a good omen, for it indicates the possible close of the long static period in our manufacturing industry. It looks as though we are about to see the same kind of a commercial awakening that is stirring the power industry to action these days. But perhaps the most promising sign is that these high executives, after so many years, should have carried their problems to "the Island" for solution. For though they may land on the dock weighted down with responsibilities and dignity as on a workday elsewhere, when the neckties are laid aside and the ceremonies and fellowship of a camp have begun comes the mellowing process that is the basis of the Island's influence. For then men begin to find how close akin they are in both their ideals and their interests, and harmony and co-ordination just naturally evolve. And so it was last week.

* * * *

The Industry Comes to the Leagues

LAST week representatives of the local electrical leagues of the country gathered at Association Island for their sixth annual conference. But this meeting was different from the others in several ways. And the most dramatic impression brought from the gathering was that the organized industry had for the first time gone to the leagues to report and interpret plans and aspirations. In other words, the leagues—few though they be and so far weak in actual accomplishment—have begun to take on the significance of an electrical democracy. For here we have all classes of electrical men banded together in the communities and their chosen delegates assembled in a national congress that may be expected some day to represent the larger cities of the entire country. What could more clearly approximate the "public opinion," the common interest and the man power of the industry?

And so this year came the presidents of the National Electric Light Association and the National Electrical Manufacturers' Association in person, and also spokesmen for the national chairman of the Electrical Supply Jobbers' Association and the president of the Association of Electragists, and they severally discussed the relationships of these major national associations with the leagues. And came the managing directors of the N.E.L.A., N.E.M.A. and A.E.I. and a spokesman for the E.S.J.A. and told of their work and plans for the service of these four branches of the industry. It was probably the first occasion on which the officials of these four organizations had ever appeared before anybody on terms of such equality to tell their stories in review. It is a precedent that may well be continued, for it was an opportunity of great value to every man who listened—including the speakers.

The accomplished reorganization of the Society for Electrical Development has brought much encouragement to the leagues, for they now have direct representation on the S.E.D. board. And the status of the leagues thus being clearly fixed, there was an absence in this conference of the uncertainty and suspicion that have been observable at former meetings because some league men feared dominance. Also a simple, satisfying, democratic method was established for electing members of the League Council. So the steam roller was pushed into the lake and the leagues are standing on their own feet, and as they increase in strength and number much good should come of them. There are 130 leagues in operation at the moment.

* * * *

Business Outlook Matters Little

WHILE the nation's industrial and financial leaders are eagerly scanning the business horizon for indicators of the autumn trend, utility executives face the outlook with little concern. The prospect of raising some three hundred millions of new capital within the next few weeks offers little difficulty. Business and industrial movements and competition do not figure among their problems—at least not so prominently. Experience has shown that they can weather storms of the greatest danger to manufacturing and distributing concerns without even a serious falling off in profits. While some recently published financial statements of industrial, railroad and automobile firms disclose a cutting down of profit margins, utility earnings for the year ended Aug. 31 have kept up an almost steady advance, and stock market movements reflect increasing public confidence.

All this ought to be convincing to prospective investors, especially at this time. When so wide a diversity of opinion exists with regard to fall prospects for the financial markets, what an opportunity for public education on the relative immunity from the effects of business depression and upheaval which the public utilities and their securities enjoy!

* * * *

Differentiating Between Glare and Visibility

LIGHTING specialists know that glare in lighting conditions is costly because of the waste it occasions in human life and effort. It is also a great deterrent to the progress of lighting, because its prevalence has led to an erroneous but far too general acceptance of it as a necessary evil in artificial lighting. It is obvious to the well informed that glare can readily be eliminated from lighting, and this is usually possible through very simple expedients involving mainly the proper location of proper lighting equipment. Among lighting men glare is constantly discussed; still, the question "What is glare?" generally elicits no satisfactory simple answer.

Glare could be defined as that factor in a lighting con-

dition by which a bodily disturbance arises, characterized by discomfort, distraction, irritation or pain which is attributed to absolutely or relatively high brightness in the visual field. Lowered visibility is not a characteristic of glare, although it may be present in some cases. Guided by such a differentiation as suggested, visibility would not be a measure of glare, although in the cases where it is influenced measurements of it would give information pertaining to one of the influences of glare.

Visibility could be considered to mean the state, quality or capability of being seen, and "seeing" can be appraised in no other way than by the behavior of the subject who is supposed to see, whether his response is appropriate or not. It could be defined as the statistical ratio of the number of times an object is "seen" (not guessed right) to the number of trials. From some such beginning much progress could be made toward clarifying other terms which are relics of the recent past when much less was known of the fundamentals of lighting.

* * * *

Street Lighting Is the Entering Wedge in Electric Sales

APPEARANCES count greatly in sales. Any city with well-lighted streets affords a market for the electrical industry, and this indirect sales asset is one reason why utility companies should push street lighting with vigor. Once a city has adopted modern street lighting, shabbiness becomes visible and electric signs and well-lighted stores are inevitable. Street lighting should be used as an entering wedge to a large increase in commercial lighting.

Utilities should devote major attention to street lighting from the standpoint of public relations. This policy will afford their executives a needed contact with municipal officers and will serve to show how they can cooperate effectively in plans for civic improvements. Good street lighting brings about an optimistic attitude on the part of the city's inhabitants, and they awaken to a keener realization of the conveniences and comforts afforded by electric service. If capitalized in terms of electric sales and good will, this sentiment makes a valuable asset for the light and power company. There should be no let-up in street-lighting installations, and an aggressive attitude on the part of utilities is a needed element in the furtherance of this program.

* * * *

Selective Application

THE choice of grade of equipment for installation in a plant depends mainly upon the use to which it is to be put. Some processes require machinery of the heavy-duty type, necessarily expensive, while other processes can utilize machinery of a lighter and less costly type but which will be adequate for the duty required of it. Equipment should thus be selectively applied to meet the duty which it must perform.

Frequently in designing a plant the engineer has veered to one side or another in his choice of equipment, depending somewhat on the preponderance of either, but nearly always favoring the heavy-duty apparatus owing to its very high operating factor of safety, even though this high factor was not necessary in all cases. An important contributing cause in making such a selection was the need for simplifying maintenance in reducing the number of spare parts to be carried.

This practice in design has persisted to some extent, despite the fact that with few exceptions present-day equipment requires little maintenance and fewer spare parts are necessary. For instance, the heavy-duty crusher in cement, which will be subjected to many starts and stops under heavy load, must have very rugged starting equipment, whereas a fan or blower, which must run continuously, can use light-duty starting equipment. As another illustration, the heavy-duty bus supports and disconnecting switches used by a central-station company where the apparatus has more frequent operation and harder service need not be used in the average industrial plant. Instead, a lighter-duty type can be used and will satisfactorily fill all needs.

More careful attention should be paid to selective application service, since interest on the investment is as important a factor in costs as are actual operating expenses. Where the duty which an apparatus must perform is light, it is obviously uneconomical to install heavy-duty and necessarily higher-cost equipment. Each type has its place and function, and selection should depend on all the factors involved.

* * * *

Public Relations and Underground Construction

MOST utility construction projects can be scheduled without consideration of public relations. But street-lighting installation and underground systems cannot be made without weighing the effect of public sentiment. This is specially true of plans to go underground with systems previously overhead, because the investments are very large.

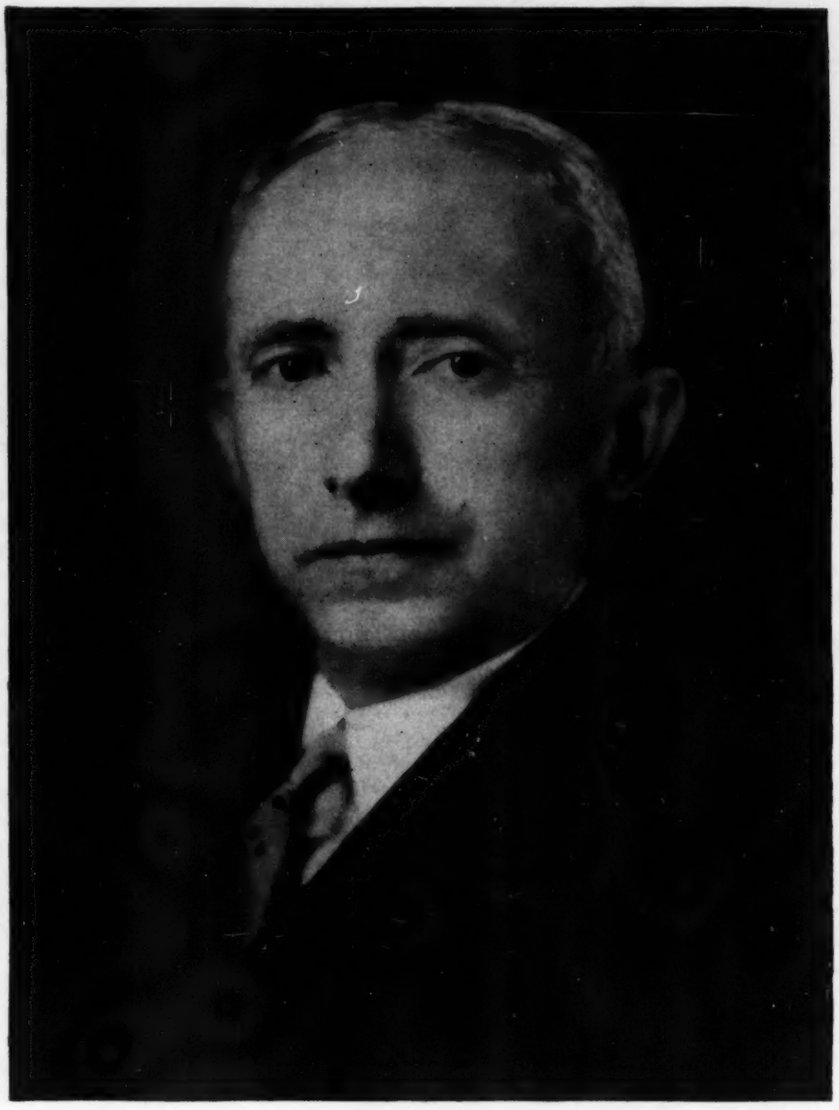
At best it is difficult to determine the economic load density which warrants an underground installation. As a rule the utility executive goes to underground construction as a public relations move and as part of his desire to make civic improvements. He hopes that load growth will be rapid enough to justify the expenditure. But any utility plan to schedule underground construction by piecemeal is apt to come to disaster on the rock of public relations. If people on A Street have underground construction, then people on B and C Streets demand the same construction on the plea of discrimination and the further plea that their streets are harmed by unsightly overhead wires.

The utility executive may plead that load density is greater on A Street, that the cost of underground construction is several times that of overhead construction, that money is not available, that B and C Streets will obtain underground construction in a year or two; but the public will not agree to these valid pleas and will bring the tremendous pressure of public sentiment to bear. It is a dangerous thing to attempt to change an existing overhead system to underground on a step-by-step basis.

Good public relations should not be jeopardized by a long-drawn-out program of underground construction, and the safest plan is to tell the public early and late of the plans before construction is started, to use entire sections of a city as part of a step-by-step change, or to do the job for the whole city as one project.

Thomas Wesley Martin

Lawyer and utility executive whose ability in the realm of corporate organization and finance has had a lasting effect on the progress of electrical development in the South.

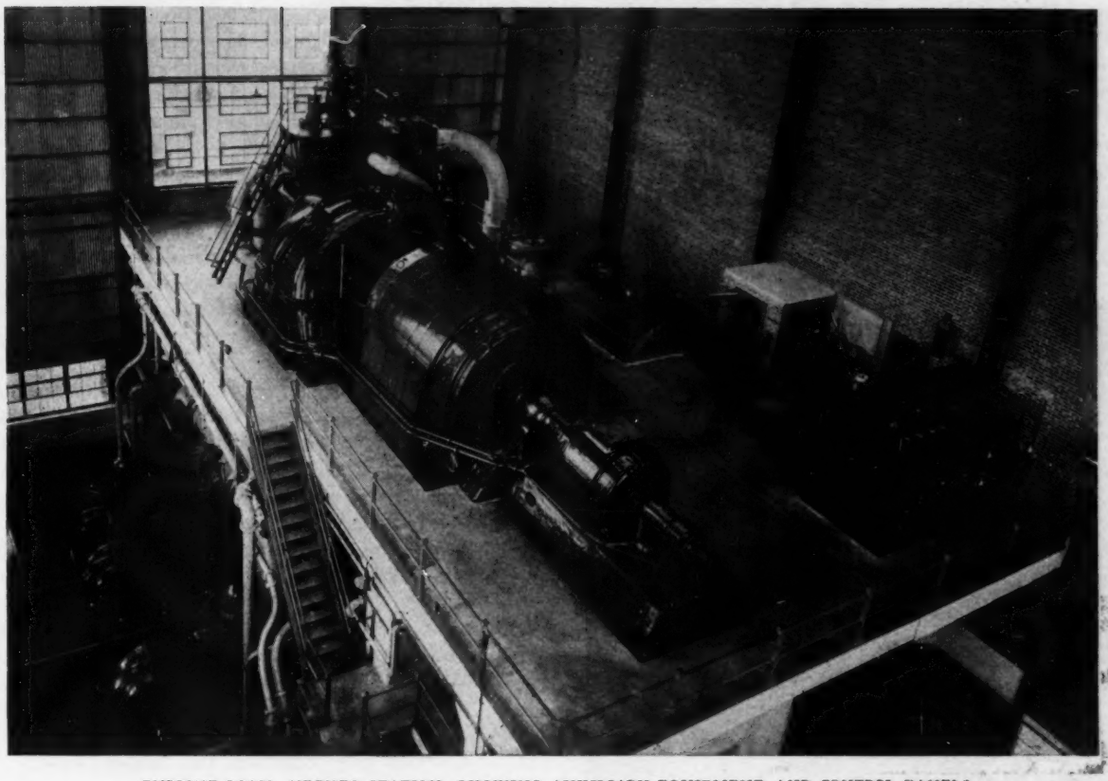


THOMAS W. MARTIN, president of the Southeastern Power & Light Company and of the Alabama Power Company, is one of the chosen few who have made possible during the past ten years the unparalleled advances in the application of electricity throughout the Southeastern States. He has always believed that the power industry is the basic industry and that this, together with adequate transportation and education, would solve the South's problems and assure its future.

Born at Scottsboro, Ala., on Aug. 13, 1881, Mr. Martin removed to Montgomery at an early age, where he attended local schools and later the Law School of the University of Alabama. He then began to practice law in Montgomery. From 1903 to 1911 he was Assistant Attorney-General of Alabama, after which he again entered upon the practice of law. During this time he represented many of the state's pioneers in the development of water power, so that he was familiar with his subject when he undertook his duties as general counsel of the Alabama Power Company at the time its interests were acquired by the late James Mitchell and associates in 1912. In 1916 Mr. Martin was made a vice-president, and in February, 1920, upon the severe illness followed by the death of James Mitchell, he became president.

Since he assumed his office the board of directors has been extended to include Alabamians of prominence in business and banking circles, and the Canadian and English control of the power company has been changed to American, thus lodging the management and control of the company largely in the South. Mr. Martin and his associates have inaugurated a well-thought-out and well-executed program of customer ownership, revamped the financial structures of the utilities with which he is connected so that they are now flexible and much more adequate, and have further developed the idea of interconnection that has been such an important factor in the growth of the South. Since Mr. Martin became president the construction program of the hydro-electric projects has included Mitchell Dam, the acquisition and reconstruction of the Upper and Lower Tallassee plants, Cherokee Bluffs (the name of which was later changed to Martin Dam) and Lock 18.

Mr. Martin is a past-president of the Southeastern Geographic Division of the N. E. L. A. and has been active in this association's business for many years.



TURBINE ROOM, NECHES STATION, SHOWING AUXILIARY EQUIPMENT AND CONTRCL PANELS

Gas and Oil Burners Combined

Protection against service interruptions and simplicity mark Neches power station of Gulf States Utilities Company— Features of auxiliary services

By H. R. SHARPLESS

Supervisor of Production
Gulf States Utilities Company, Beaumont, Tex.

A SYSTEM of dual fuel supply, gas and oil, with provision for changeover to the use of pulverized coal is a feature of Neches power station. Unusually complete precautions to insure continuity of service have been provided by the Gulf States Utilities Company in the first unit, recently completed, of a station the ultimate capacity of which is expected to reach 200,000 kw. and which marks a development in a comprehensive plan to give service to southeast Texas and southwest Louisiana. Transmission lines now interconnect nine communities, including Beaumont and Port Arthur, covering a territory more than 200 miles long. The station is situated on the banks of the Neches River, two miles south of Beaumont, Tex.

The initial building structure houses one 25,000-kva., 13,200-volt Westinghouse turbo-generator and two 1,530-hp. Babcock & Wilcox 400-lb. boilers with electric-driven auxiliaries of the latest type. Simply a condensing system, turbine room, boiler room and step-up substation have been built. An electrical bay and office layout have not been included with the first unit.

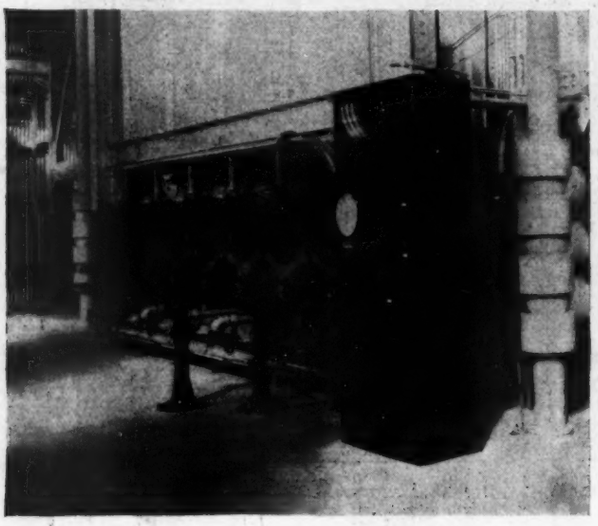
This station is designed primarily for the use of natural gas as fuel, but has a complete fuel oil system installed for stand-by purposes. Natural gas, of approximately 930 B.t.u. per cu.ft. content, is used.

The gas, received at a pressure averaging 100 lb., is first metered with a Wescott orifice meter and then reduced to 10-lb. pressure for use at the boilers by two reducing valves operating in series. The gas company also meters the gas at its end of the line, and it is interesting to note that over a period of several months there is a difference of only about 0.5 per cent between the two total gas figures. The metering and reducing equipment is located in a separate building.

Fuel oil is obtained normally through a pipe line direct from the refinery. For emergency, a separate line and unloading pit for tank-car delivery are provided.

All incoming fuel oil passes through the station fuel

oil room, where it is metered, and then passes directly to the service tanks. Four fuel oil service tanks of horizontal, cylindrical, steel construction and 600-bbl. capacity each are provided. They are located outside of the building with the tank tops below the level of the pump room floor. Each tank is provided with a steam coil heater, which incloses the pump suction pipe, and the drips are returned to a trap in the fuel oil room. There is a steam-smothering line to each of the tanks for use in case of fire. All steam for the fuel oil tanks



COMBINED OIL-GAS BURNER FEED ARRANGEMENTS AND BOILER ROOM CONTROL PANEL

is obtained from the 175-lb. auxiliary steam header, and all of the control valves are located in the fuel oil room. Each service tank is also equipped with a Foxboro liquid level gage, with high and low alarms, and a Foxboro dial-type indicating thermometer mounted on a suitable panel in the fuel oil room.

The fuel oil service room contains the following pumping equipment: Three Quimby positive pressure rotary screw-type pumps. One of the pumps is driven by a non-condensing Terry turbine, taking steam from the 175-lb. auxiliary steam header and exhausting into the auxiliary exhaust system. The two other pumps are driven by 440-volt, variable-speed, slip-ring type motors.

As the service tanks are below the pump level, all pumps must be primed from the station priming system before being placed in operation. A 40-ft. inverted loop in the priming line precludes possibility of oil being carried over into the main priming system under normal conditions.

Three Griscom-Russell fuel oil heaters are installed, taking steam from the low-pressure auxiliary header. A feature of this installation is that steam to any or all of the heaters is controlled by the viscosity of the oil leaving the heaters rather than by the temperature. This is taken care of by a Peabody viscosity regulator.

The necessary strainers on the incoming and outgoing oil lines, as well as on each pump suction, are installed in this room. Fire protection is provided by a steam-smothering line encircling the entire room and controlled from the outside. After leaving the pump room, the oil is transmitted direct to the boiler room. As the Peabody wide range firing system is in use, a return header from the boiler room carries the surplus oil back to the service tanks.

The fuel-burning equipment consists of eleven Peabody combination gas and oil-type burners per boiler, it being possible to change from gas or oil, or vice versa, in a few minutes. The burners are arranged in two rows across the front of the furnace, six in the bottom row and five in the top.

This type of burner has a gas slot around its entire periphery, and it is found that with an average slot width of 0.040 in. approximately 3-lb. gas pressure gives very good results. Ordinarily a wind box pressure of about 1.5 in. and a furnace draft of 0.03 in. is used. The fuel is fired into a 8,650-cu.ft. furnace having side walls, rear wall and floor water cooled by Bailey type water-wall construction. This type of wall has its tube surface covered with refractory-faced cast-iron blocks and was installed primarily for lessening furnace maintenance. Both boilers have now had about 3,000 service hours, averaging 190 to 200 per cent rating, and have carried sustained daily loads of 270 to 280 per cent rating without any noticeably bad effects on the furnace. One furnace has never lost a refractory facing, whereas only five or six refractory blocks have spalled off in the other.

Each of the side walls has its own steam- and water-circulating connections to the main boiler drum. The rear wall and floor connections are combined and have their own steam and water connections to the boiler drum. Total refractory surface of water screen is equivalent to 9.41 per cent of the boiler-heating surface. Ample provisions were incorporated in the furnace design for future changeover to pulverized fuel, should it become necessary.

Air for combustion is supplied by 30,000-c.f.m. forced draft fans of American Blower Company make. There are two to each boiler, with separate ducts leading from the fan floor to the main firing floor, at the rear of the boilers. The ducts, traveling along the side walls of the furnace, terminate in a common wind-box extending across the entire furnace front, in which the burners are installed.

The fans are driven by 2,300-volt, 50-hp., variable-speed, slip-ring type motors, remote controlled from the boiler room floor, with emergency stop stations on the fan floor. Each motor has a 30-point drum controller, but the two controllers are so mechanically interlocked that a total of 61 control steps are obtained with the two fans.

Combustion Control Automatic

On the firing floor are located Bailey control panels with the necessary meters and gages for indicating furnace and boiler conditions, together with the various control switches and buttons for the fan motors, uptake damper and fuel valves. On the back of this panel are mounted the automatic controls for the fan motors and uptake dampers which govern furnace combustion. These devices transmit electrical impulses to Bailey mechanical controls on the fan room floor and automatically adjust the speed of the forced draft fans and uptake damper openings. Once adjusted, this system is entirely automatic and the fireman has only to regulate the fuel valve for a corresponding steam flow. In the future the fuel valve will also be operated automatically, thus making the system entirely automatic under normal conditions.

In addition to the entirely automatic feature, it is necessary only to dial a rotary drum switch in the center of the control panel, and each control is placed

either on hand or automatic operation as the operator desires. On hand control, push buttons are used in place of the automatic Mercoid switches. In case the control system becomes inoperative, declutching devices are provided on the mechanical controls so that the fan and damper controls may be operated from this point by hand.

Ample provisions were made for the installation of air preheaters and induced draft fans and at the present time, these are in the process of installation.

Both fuel valves, gas and oil, are motor driven and are electrically interlocked with the gas and oil pressures respectively so that if the fuel pressure decreases to a predetermined point, the valves close and may not be opened until the pressure returns. This is to preclude any possibility of furnace explosion, due to fuel pressure going off and coming back on unexpectedly.

These valves also close if the non-return valves, which are motor driven, close, or if the fan motors lose their operating supply current, which would cause them to shut down.

Feed Water De-Aërated

Two 1,530-hp. Babcock & Wilcox cross-drum type boilers, designed for 400-lb. working pressure, together with a B. & W. interdeck superheater, supply steam at a temperature of 700 deg. Figured on the boiler heating surface, this evaporation is equal to about 370 per cent rating. Water levels in the drums are controlled by Stets feed water controllers on each feed line. Although all feed water is de-aërated to zero content and no signs of oxygen corrosion have appeared, the drum, tubes and water-screen tubes of each boiler have been treated with two coats of Apexior paint. This makes cleaning of scale a simple matter.

As originally installed, the superheaters had 308 2½-in. tubes, arranged in three sections 29 tubes wide and four tubes deep, making a four-loop triple-pass superheater. Forty tubes, 29 outer loops in the first section and eleven in the second, were intentionally left out, but it was found that the amount of surface on the water walls absorbed so much heat that the total steam temperature was only about 640 deg. at 200 per cent rating, whereas 700 deg. had been expected. After installing the remaining 40 tubes, making a total of 348, and placing a 2-ft. tile baffle at the front header on top of the sixth row of boiler tubes so as to divert more gases over the superheater, a rise in temperature was obtained and a total steam temperature of approximately 700 deg. F. at 200 per cent rating was secured.

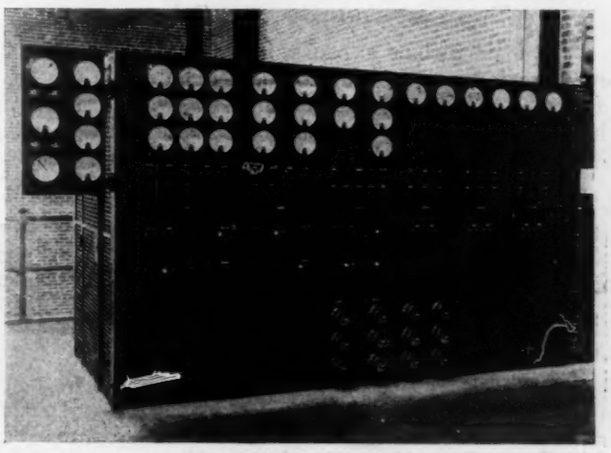
The boiler leads have hand-operated gate valves at the header and leave the boiler superheater outlets through angle-type, motor-operated non-return valves. These valves are wired for emergency closing only from an emergency steam-control panel just inside of the main entrance to the station.

Both the turbine lead and auxiliary header lead have motor-operated gate valves at the header, with control stations mounted near the valves. Emergency closing stations are also mounted on the emergency steam-control panel.

A 2½-in. Mason reducing valve takes steam from one end of the high-pressure auxiliary header and feeds a low-pressure auxiliary steam header at 175-lb. pressure.

All drips from the fuel oil room are returned to a waste sump and pumped to the sewer to eliminate chances of contamination in the service water system. All high-pressure header drips are returned to a common drip receiver tank located on the condenser room floor, from which they are discharged by a motor-operated valve to the de-aërator heater. The motor-operated valve is controlled through a system of mercury columns by the water level in the receiver.

The main turbine is a Westinghouse unit, consisting of an 1,800-r.p.m. Bauman type steam turbine, driving a 25,000-kva., 13,200-volt main generator, and a 1,250-kva., 2,300-volt auxiliary generator, with a direct-connected auxiliary generator exciter. Openings are provided at four points on the turbine to permit extraction of steam for regenerative heating of feed water. The turbine is designed to take steam at 350-lb. pressure



MAIN CONTROL PANEL, NOTABLE FOR SIMPLICITY AND EASE OF OPERATION

and 700 deg. F. total temperature. The computed water rates under the above-mentioned conditions and at various loads are as follows:

Kw. Load on Turbine	Lb. Steam Per Kw.-Hr. No. Extraction	Lb. Steam to Condenser Per Kw.-Hr. Full Extraction and Evaporators on Second Point	Lb. Steam to Throttle Per Kw.-Hr. Full Extraction and Evaporators on Second Point
21,000	9.80	8.67	11.04
15,000	9.97	8.84	11.21
10,000	10.80	9.70	12.12

The estimated pressures and temperatures at the various extraction points under full load conditions of 21,000 kw. are as follows:

	Point of Extraction			
	First	Second	Third	Fourth
Absolute pressure (lb.)	139	60.6	15.4	3.9
Temperature (deg. F.)	435	391	214	152
Superheat (deg. F.)	183	99% (quality)	98.9% (quality)	94.2%

Operating conditions have been found to closely approximate these figures.

Duplicate oil coolers are provided in the turbine oil system, taking cooling water from the auxiliary cooler pump system. A continuous partial oil filtration installation is provided on the main unit, as well as connections to the lubricating oil room so that the oil in the turbine system may be renewed and the old oil purified with a centrifugal type oil separator.

The main and auxiliary generators have inclosed air-circulating systems cooled by Griscom-Russell surface-type coolers. A Foxboro dial-type indicating thermometer is provided on each generator, indicating the generator air discharge temperature, with a high-

temperature alarm attachment operating an annunciator drop at the switchboard. Water for these coolers is obtained from the auxiliary cooler pump system, taking water from the intake tunnel.

This system is normally supplied by a 650-g.p.m. centrifugal pump, pumping first to the generator air coolers in parallel; second, to the oil coolers in parallel; third, to the condenser air ejectors in parallel, and thence to the circulating water discharge flume. Should the pump fail, a check valve opens and allows water from the power service system to flow through the auxiliary cooler system. An emergency pump on the power service system is provided for this contingency.

Two-Pass Compartment Condensers

The main turbine exhausts into a Westinghouse radial flow condenser, with 35,000 sq.ft. of effective tube surface and capable of condensing 210,000 lb. steam per hour to 1.27 in. of mercury absolute pressure, using 44,000 g.p.m. circulating water at 70 deg. F. temperature. It is of the two-compartment, two-pass type. The water boxes are divided vertically, with a circulating water inlet and outlet connection into each compartment, so as to be able to clean or maintain one side of the condenser with the other side in service under light load.

The circulating water is supplied by two 26,000-g.p.m. Westinghouse double suction centrifugal pumps, driven by 200-hp. slip-ring type motors. Suction valves on the pumps are hydraulically operated.

Duplicate Westinghouse two-stage air ejectors, with inter- and after-condensers, are provided for removing the non-condensible gases from the main condenser. A Foxboro dial-type indicating orifice meter is installed for measuring the air flow from the air ejectors.

In cool weather with 55 to 60 deg. F. circulating water, one pump is sufficient with loads up to 15,000 kw., about 12 deg. rise in circulating water being obtained at this load. In warmer weather it is necessary to use two pumps at loads over 10,000 kw. Condensate temperatures with this type of condenser are excellent, being not more than 0.5 deg. from the exhaust steam temperatures.

Three Worthington Jeanesville pumps are installed for boiler feed; two of these are driven by 2,300-volt, slip-ring type motors, and one by a Westinghouse non-condensing turbine, taking steam from the high-pressure auxiliary header. Boiler feed make-up is supplied at the de-aërator in the form of vapor from a two-stage Griscom-Russell evaporator. As approximately only 4,000 gal. a day make-up is required, the evaporators are run only several days each fortnight, distilled water being stored in a 92,000-gal. concrete tank under the station service electrical room floor.

The condensate, after leaving the pump, passes first through the fourth point extraction heater, where it is raised from 85 deg. F. to 145 deg. F. by steam from the fourth extraction point on the turbine, then through the third point heater, where it is raised to 205 deg. F., to the de-aërator heater. This de-aërator heater takes steam from the second extraction point and raises the feed water to 233 deg. F., at the same time completely de-aërating it.

With higher pressures and temperatures and pure distilled feed water, oxygen corrosion is a serious factor and must be eliminated. The logical way to do this is to de-aërate all water before it enters the boiler-feed system. A Cochrane de-aërating heater of 300,000 lb. per hour capacity is installed for this purpose and has

OUTDOOR SUBSTATION, WITH SPACE ISOLATION OF BREAKERS AND TRANSFORMERS

practically eliminated all oxygen from the feed water to date. With oxygen content of condensate leaving the pumps as high as 4 to 6 cc. per liter, water after leaving the de-aërator has a negligible oxygen content and is non-corrosive.

Auxiliary Services

All auxiliaries except the air ejectors are electrically driven normally, and heat balance is automatically taken care of by a regenerative system of feed-water heating. Should it become necessary to operate steam-driven auxiliaries, however, the auxiliary exhaust header has been provided with a reverse flow valve leading to the de-aërator as well as a back-pressure relief valve to atmosphere.

Excitation on the main unit is supplied normally with a 250-volt direct-current generator, driven by a 2,300-volt induction motor. A dual-driven spare exciter, having a 250-volt direct-current generator mounted between a 300-hp., 2,300-volt induction motor and a 300-hp. Westinghouse non-condensing turbine, is also provided. The auxiliary generator has its own direct-connected 250-volt generator exciter, but may be excited direct from the main excitation bus. The exciters are protected from overspeeding by reverse current relays rather than overspeed centrifugal trips.

In addition to the 1,250-kva., 2,300-volt auxiliary generator, the station service system derives power from a 2,250-kva., 13,200/2,300-volt transformer bank supplied through the 13,200-volt bus from the main generator.

The station service truck type switchboard is sectionalized with a bus tie switch, the auxiliary generator feeding one end of the bus and the station service transformers the other. All 2,300-volt electrical auxiliaries are so divided that duplicates or alternatives derive power from separate ends of the station service bus, and with the bus tie open, which is the normal operating condition, this means deriving power from separate sources. With this system it is almost impossible to lose all of the auxiliaries at one time in case of trouble. As the most important auxiliaries are kept on the auxiliary generator end of the station service bus, it is further protected by the fact that should the auxiliary generator switch trip out from loss of voltage or differential protection, the bus tie switch will close automatically, restoring power to station service supply end of the bus.

All main switching equipment except the low-voltage auxiliaries and about one-half of the 2,300-volt auxiliaries is remote controlled.

All 2,300-volt induction motors, except exciter motors, which have single-step compensators, start on full-line voltage. All 440-volt induction motors also start on full-line voltage. All 2,300-volt slip-ring type motors are started in the usual way, but have emergency contactors that cut in a certain amount of starting resistance, should the motor lose its potential while in service. When the potential returns and the motor speeds up, the contractors automatically shunt out the resistance and leave the motor running in proper manner.

Dielectric Puncture Under Oil

Failure of Solid Dielectrics Is Not Instantaneous—Breakdown May Be Partial—Unbalanced Field Stress Causes Puncture

By J. T. Littleton, and W. W. Shaver
Corning Glass Works, Corning, N. Y.

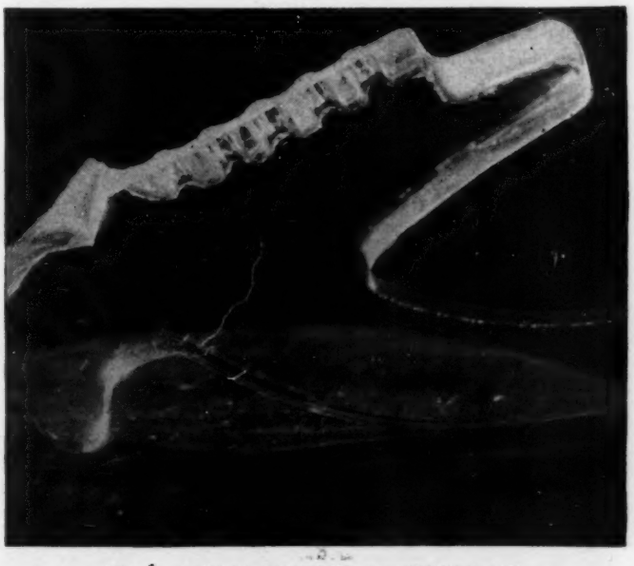


FIG. 1—PARTIAL PUNCTURE AS INDICATED IN A PYREX INSULATOR

IT IS generally believed that electrical puncture of a solid dielectric is an instantaneous phenomenon. Preliminary to puncture various changes are believed to take place in accordance with the particular theory adhered to. The theories developed depend largely upon measurements made on materials of different properties and at different temperatures. There seems to have been little study of the dielectric itself while under electrical stress or little study of dielectrics after having been subjected to intense electric fields. Since most commercial insulating material is opaque, it is easy to

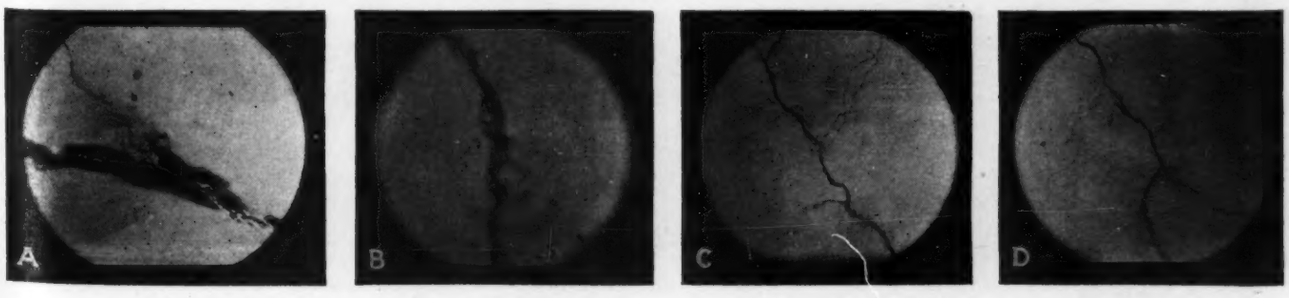


FIG. 2 A, B, C, D—PORTIONS OF THE PUNCTURE PATH TRACED IN FIG. 1 AS SHOWN BY 100-POWER MAGNIFICATION

understand why this phase of the work has been neglected.

The observations described here are not cited for the purpose of developing any particular theory of dielectric breakdown, but they do undoubtedly add some definite information to the subject, hence it seems worth while to record them.

Time Required for Insulator Failure

Experiments were made that show that dielectric failure of solid dielectrics when tested under oil is not instantaneous, but is a slow, progressive failure lasting over several minutes of time. The failure may be complete or may be only partial.

The equipment used was a 150-kva., 300-kv. transformer, center grounded, controlled by an induction regulator.

In giving insulators standard 60-cycle puncture tests under oil, the oil being in a glass jar, it was observed that there was considerable breakdown of the oil. Preceding puncture the breakdown paths seemed to be quite definite—that is, as soon as a breakdown took place from the conductor to the insulator surface this path was

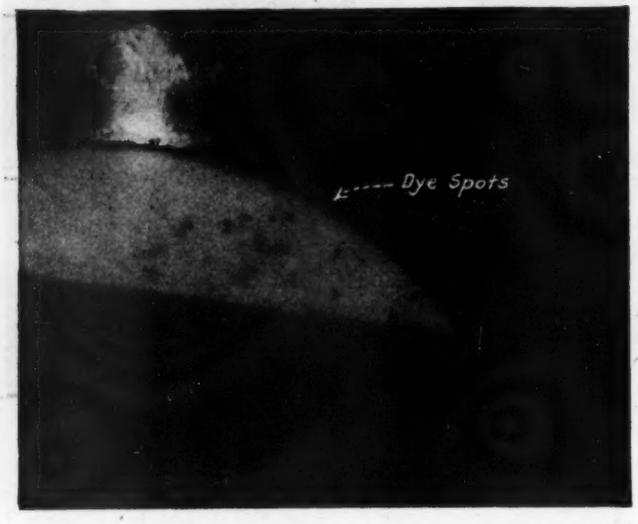


FIG. 3—PARTIAL PUNCTURE IN PORCELAIN INSULATOR AS SHOWN BY DYE SPOTS IN A SECTION OF THE PORCELAIN

established and breakdown, though not continuous, repeated itself over the same path. In the case of Pyrex insulators, the discharge did not end on the surface, but could be seen gradually to force itself through the insulator, advancing slowly during the first stages of the puncture and quite rapidly during the later stages. If the voltage were taken off, the insulator would be left partly punctured. The partial puncture looked like a very minute lightning discharge going partly through the insulator. Partial punctures can be best obtained by holding the voltage constant at a value just above the oil breakdown voltage. At such a voltage it may require several minutes for complete puncture to take place.

The same type of breakdown takes place in porcelain. This was shown to be the case by stopping the discharge a short time after oil breakdown had been observed and, after properly cleaning the insulator, forcing dye under pressure into holes caused by the partial puncture. Then by cutting a section through the insulator the partial punctures were shown by small dye spots where the punctures intersected the plane of the cut. Many such partial punctures can be observed in one insulator.

In Fig. 2*b* a rather peculiar effect is shown. The breakdown seems to have advanced in definite steps with a rather large pool at the end of each step. This pool may be caused by the change of direction of the discharge.

In Fig. 2*a* are shown a number of branches from the main path uniting in another branch.

If the discharge path is followed with the higher power microscope, it is seen to end in a rather peculiar manner. The dark line corresponding to a hole ends abruptly and a diffraction pattern extends further. This pattern then fades out until it is no longer observable under a 500-power magnification. When complete breakdown occurs, the path is of course many times enlarged by the current followed breakdown. However, many partial punctures can be observed at other points radiating inward from the surface.

Various oils were used in the tests. The breakdown was of the same nature in all the oils, though the character of the oil had a considerable effect upon the breakdown value.

Conclusions Indefinite

There is local heating along the path of the partial puncture, but not ahead of the puncture. The breakdown seems to be in the nature of the advancement of a hot spot or ionization slowly cracking its way through the material, though it is very probably not so simple as that. The partial puncture glows brightly during the process of its formation.

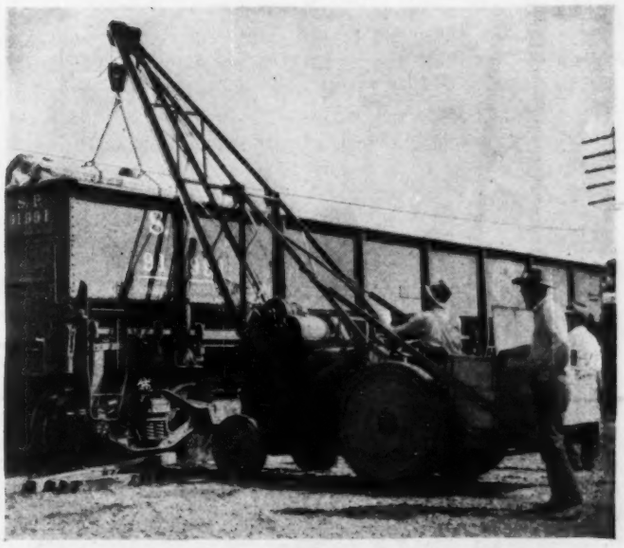
There seems to be no evidence of a breakdown being caused by heating attended by an increase in conductivity. The failure seems to be caused by some point either on the conductor or on the insulator intensifying the field at the point until breakdown of the oil occurs. This breakdown redistributes the field and further concentrates it at the point until another failure takes place, advancing the puncture a short distance. This process continues until complete failure of the insulating material has taken place.

At any rate, regardless of what is happening, the dielectric puncture is dependent upon the oil breakdown to start it off and to a certain extent to keep it going. The sudden release of energy and impact of the discharge through the oil weaken the surface of the dielectric at the point of impact, and this weakening localizes more energy in the next discharge, and the effect progresses until puncture occurs. No explanation is attempted for the character of the discharge path and its many branches, some being apparently at right angles to the electrostatic field of force. The striking similarity of the puncture path to that of lightning discharge would lead one to surmise that the similarity was more than one of appearance.

Further work is being done on the study of this phenomenon. The effect of the thickness of the dielectric on dielectric strength of the material will be studied, for very probably the oil breakdown has considerable effect on the form of the curve between puncture voltage and thickness. Another point being investigated is the control and effect of the oil in precision dielectric strength measurements. The fact that a partial puncture can be formed should make insulator manufacturers extremely careful in applying a routine overpotential test under oil if impairment of their products is to be avoided.

Economy in Transmission-Line Construction

By JOHN A. KOONTZ
Electrical Engineer Great Western Power Company
San Franscico, Cal.



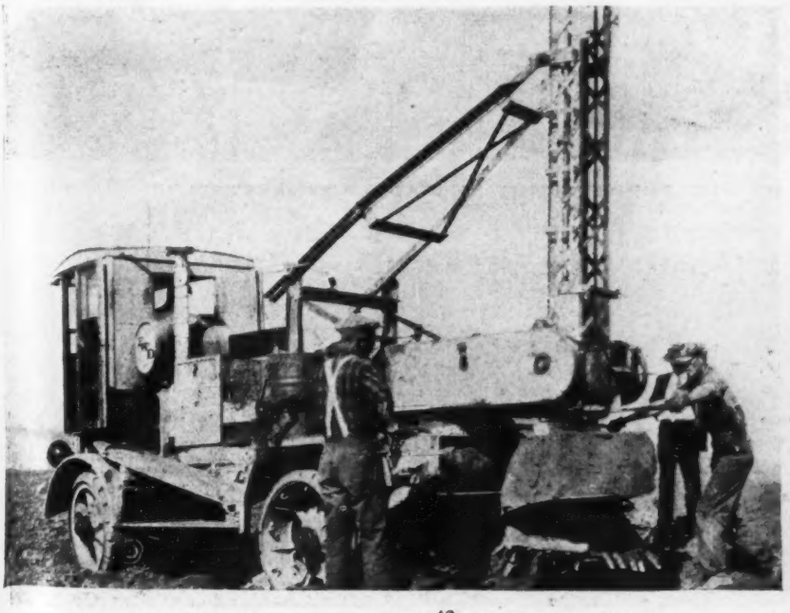
PORTABLE CRANE FOR UNLOADING TOWER STEEL FROM FREIGHT CARS

IN ERECTING the first circuit of a two-circuit 220,000-volt tie line between Sacramento and Merced, Cal., to interconnect the systems of the Great Western Power Company and the San Joaquin Light & Power Corporation, special study was made of construction methods with a view to using mechanical equipment to minimize labor costs. The cost of 102.7 miles of line, including a 75-ft. right-of-way, double-circuit steel towers and one 795,000-circ.mil aluminum circuit was kept down to the very reasonable figure of $15,500 per mile.

After the initial reconnaissance by automobile, aërial photographs were made and used to guide the field men in locating the line. These pictures gave the surveyors warning of buildings in their path ahead and permitted them to throw an angle of a few degrees in the line until the obstacle was passed. Angles of from 2 to 4 deg. were taken on suspension towers without impairing clearances.

Transportation.—Transportation of material presented quite a problem because of the wide variety of conditions under which material had to be hauled. Tractors and trailers had to be provided with hard rubber tires suitable for highway transportation; industrial tractors were equipped with angle-iron grousers on the rear wheels for work in soft ground, and provision had to be made so a farm tractor and a crane could be loaded on the trailers and hauled over the highway to the various points of utilization.

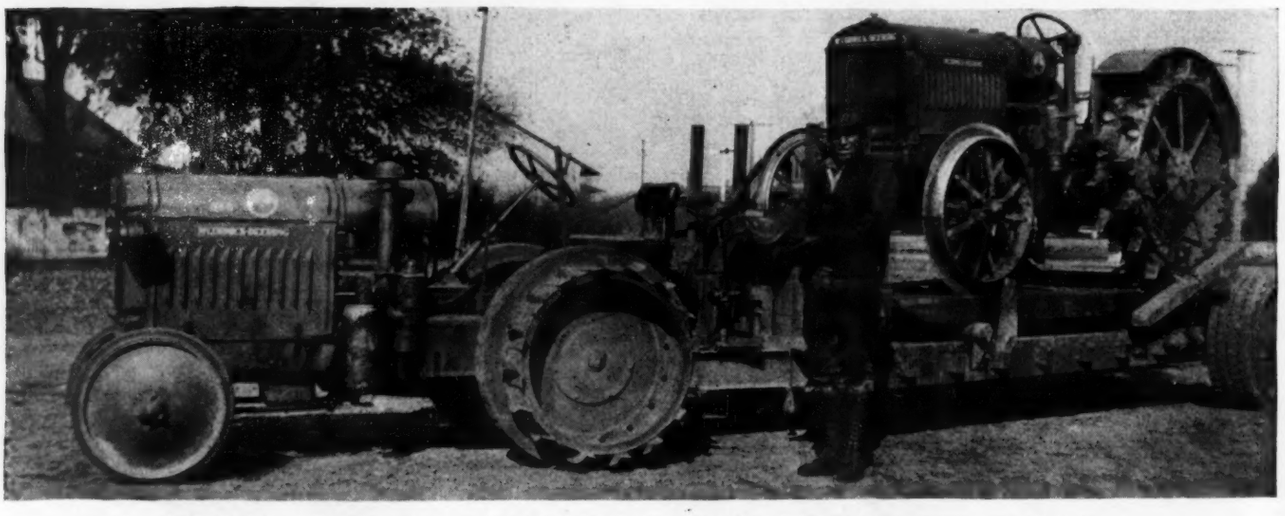
To reduce transportation and inspection costs, the steel for each tower was bundled and shipped in eleven bundles weighing from 600 to 800 lb. each. The pieces of steel for each tower were specially selected and nested together to facilitate transportation and erection. These bundles were carefully checked as to contents at the fabrication plant of the Pacific Coast Steel Company in San Francisco and no additional check was necessary until they were finally opened and the pieces laid out to commence erection at the final tower location. The bundles were carefully loaded on gondola freight cars with sufficient 4x4-in. blocking to permit placing slings for unloading with the Fordson portable crane illus-



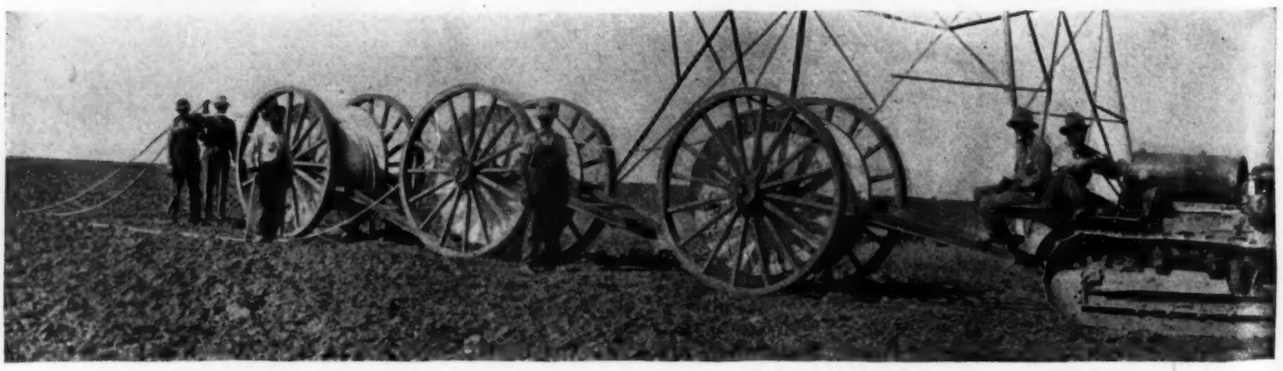
HOLE-BORING MACHINE WITH 42-IN. TOOTHED AUGER FOR DIGGING TOWER FOOTING HOLES

LIGHT STEEL TEMPLATE FOR ACCURATELY PLACING TOWER FOOTINGS

TRACTOR AND TRAILER HAUL TWO COMPLETE TOWERS TO FIELD LOCATION



FARM TRACTOR LOADED ON TRAILER FOR RAPID TRANSPORTATION BY HIGHWAY TO WORKING CENTERS



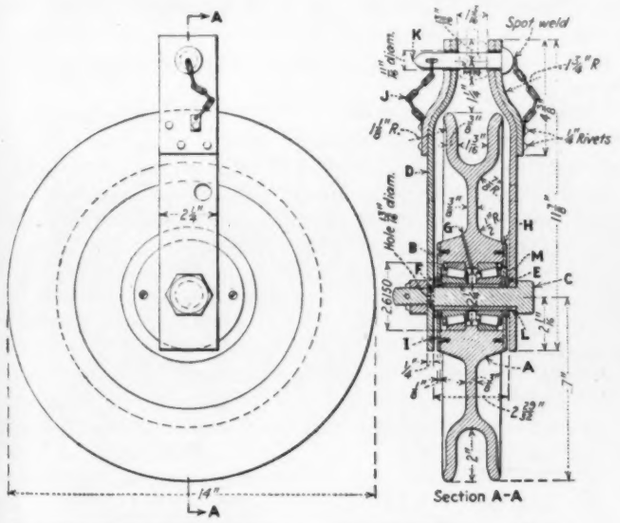
TANDEM-DRAWN REEL CARTS FOR STRINGING OUT TRANSMISSION CONDUCTOR

trated. This crane was used both for unloading the cars and loading the trailers.

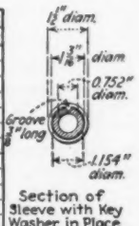
The trailers had specially designed beds lined with sheet steel and equipped with 4-in. rails, similar to lumber delivery trucks. A single tractor was used to haul the steel to the right-of-way, where a farm tractor was coupled on in addition for the more difficult haul along the right-of-way. To unload the steel the lead tractor was taken to the rear and the steel for one complete tower, constituting half the load, pulled off.

In this manner tower steel was unloaded from the freight cars and delivered to the right-of-way for $4.07 per ton, including depreciation on equipment.

Tower Erection.—Special attention was given to the tower footing design to aid in the use of hole-boring machines. Special 40-in. toothed augers were used, which permitted the earth-boring machines to dig 42-in. holes, 9 ft. deep. The teeth on an auger of this size are quite essential, as the particular earth conditions encountered required different settings and spacings of the teeth. After the machine was in place over the hole it would dig a hole of this size in hard ground in about 20 minutes at a saving of about $12 per hole over hand digging, or $48 per tower. These figures do not include depreciation. If depreciation is included, the saving would amount to $8 to $10 per hole, or a total saving of



Bill of Material		
Item	Description	Quantity
A	Cast aluminum alloy sheave	1
B	Timkin bearing No. 2690-2631	2
C	¾" Steel bolt x 4¾" long with castellated nut and cotter	1
D	⅜" x 2¼" Steel straps reinforced, hot dip galv.	2
E	Key washers ⅛" thick, 1½" outside diam., 1⅜" inside diam.	4
F	⅛" Shims	4
G	Zerck greaser	1
H	⅛" Thick, aluminum dust plates	2
I	⅜" x 2" Cap screws, steel	8
J	Chains for securing bolt and cotter pin	2
K	Cotter bolt and pin as per O.B. suspension clamp	1
L	Sleeve, 0.752" inside diam., 1.154" outside diam., 2⅝" long	1
M	Bored for drive fit Timkin bearings No. 2630-2631	



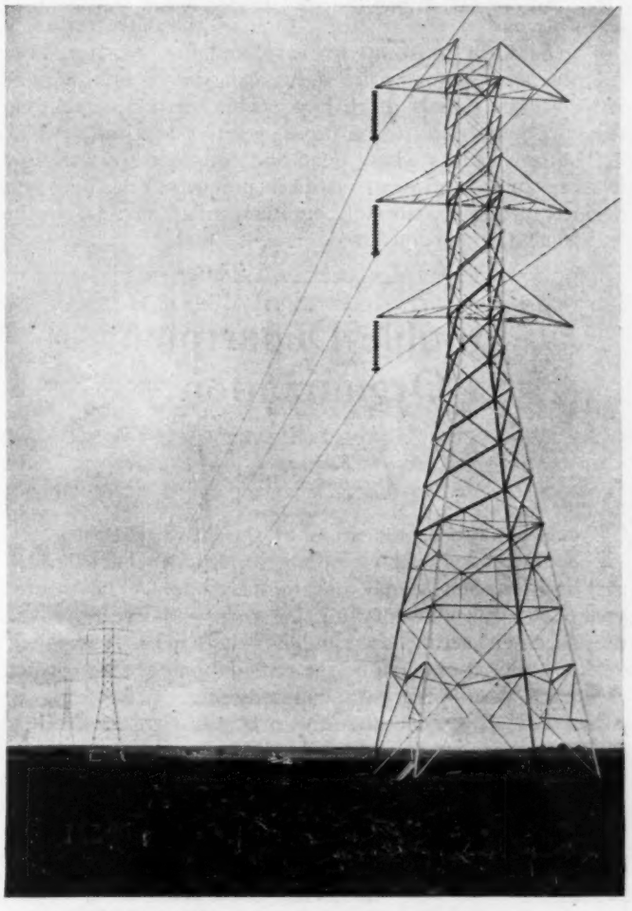
ROLLER BEARING ALUMINUM SHEARE USED IN SAGGING TWO-MILE SECTIONS OF LINE

These "travelers," as they are called, cost about $16 each to build. Use of Timken roller bearings reduced friction to a minimum and the aluminum wheel prevented injury to the steel-core aluminum transmission conductor.

$40 per tower. One of the accompanying photographs shows the earth-boring machine in operation.

Special templates made of light structural steel were used to set the footings. On account of the 24-ft. spread of the footings the templates were split into 12-ft. lengths for convenience in transportation and a special filler section was provided for use with 10- and 25- ft. tower extensions. Great care was used to place the footings accurately as to elevation and spacing, as accuracy is essential if speed is to be made in tower erection. Any misplaced tower footing will cause erection trouble and generally destroy much of the tower strength.

On account of the height of towers and size of base



COMPLETED 220,000-VOLT TRANSMISSION LINE BUILT AT COST OF $15,500 PER MILE

(100 ft. and 24 ft., respectively) it was uneconomical to assemble the towers on the ground and tip them up, as is sometimes done. They were erected either piece by piece or, in some cases, by assembling panels on the ground and tipping them up. However, the cost of the two methods did not vary materially. Care was exercised in tower design to leave bolt holes accessible, and where only a single bolt hole connection was required an extra hole would be provided in the pieces to permit the use of a wrench for prying the pieces into line for placing the bolts.

Wire Stringing.—Because of the rather level ground and the vertical tower construction used, the transmission conductors were reeled out on the ground from the large two-wheel reel carriers shown in an accompanying illustration. The three reel carts were drawn by a tractor in tandem as shown. The fourteen-unit insulator strings were hung by the use of the power winches on the tractors, and when conditions permitted, the insulator string and wire were all pulled into place and attached in one operation.

In stringing the conductor special travelers having a

double Timken roller bearing and special 14-in. aluminum alloy sheave were used. The friction on this sheave was very small and the three conductors in a two-mile section could be sagged without any trouble. In general little, if any, time is saved by sagging sections more than two miles in length. However, with large travelers it is possible to sag much longer sections if found desirable. In many cases the wire was pulled to tension by a Best "60" tractor by attaching the dynamometer directly to the drawbar of the tractor. One of these tractors will pull a 5,000-lb. tension with ease, and the operator, having the dynamometer in sight, can detect any trouble before other signals reach him. This method of sagging the wire was found to be rapid, positive and economical.

The only places where dead-end construction was used was at angle and transposition points. The line was divided into approximately eighteen-mile "barrels" in the transportation scheme used.

Trouble Department Organization

By G. F. Plant
Milwaukee Electric Railway & Light Company, Milwaukee, Wis.

THE trouble organization of the Milwaukee Electric Railway & Light Company is part of a department that also handles signal and sign activities. The trouble group comprises twenty outside men and five foremen, the foremen acting as trouble dispatchers from their desks in the office. All of the outside men are uniformed and each one operates a company car. The territory covered is so divided that the maximum travel distance from the office on any call is fifteen miles. Twenty-four-hour trouble service is afforded and there is always one foreman on duty in the office. Trouble shifts extend from 12 midnight to 8 a.m.; 8 a.m. to 4 p.m.; 2 p.m. to 10 p.m., and 4 p.m. to midnight. Overlapping of some of the shifts is provided so that during the first shift there are three men on duty, eleven during the busy part of the second and third and seven during part of the fourth. The shifts are rotated among the men in such a manner that during a year each man has 26 Sundays off duty, not necessarily every other Sunday, however.

Communication Facilities

Eight telephone desk positions are provided in the trouble office, of which two are normally occupied by girls who receive incoming calls, it being the duty of the foreman to dispatch these calls to the men outside. On account of the city and suburban electric railroads being a part of the company's system the private telephone lines of the company cover a wider territory and include more stations than is the case with the usual electric utility. Scattered about the city in various power houses, substations, offices, residences of key men and in railroad call boxes are 450 private telephones. The trouble men have keys to all of these locked telephones and in addition there are two Bell telephone lines entering the trouble room, the numbers of which are not listed publicly. If it happens that a man in the field cannot reach a company telephone easily, he will call in on one of the Bell lines. One foreman of the trouble department has no regular period of duty on the board but acts in an advisory capacity and keeps track of the system records, maps, feeder bridging and applications for feeders out of service for repairs, etc.

The trouble department of the Milwaukee company covers a greater range of work than is customary among electric utilities. In addition to taking care of ordinary cases of trouble that occur on customers' premises, the trouble men are able and are equipped to make emergency line repairs, such as bridging primaries and secondaries, small transformer replacement at night, running a few sections of wire and clearing broken poles.

Form 702 6-21-3440

The Milwaukee Electric Railway and Light Company

Application for Service Interruption

Date _____

Trouble Division:

Please arrange, if possible to have.....

out from .....M.....19.....to .....M .....19.....

for .....of the ..... Division.

Put ground wires on at.....

Nature and location of work to be done and remarks.

Clear on orders of.....

FOREMAN REQUESTING SERVICE INTERRUPTI

will be out from .....M.....19.....

as request by Mr. .....

(See instructions

REQUEST FOR SERVICE INTERRUPTION

(*Below*)
CUSTOMER'S ACKNOWLEDGMENT OF WORK PERFORMED AND MATERIAL USED

Form 739—9.26—500 Books

THE MILWAUKEE ELECTRIC RAILWAY AND LIGHT COMPANY
GENERAL OFFICES—PUBLIC SERVICE BUILDING

№ 25851

Trouble Department Services Rendered To, Milwaukee, Wis. _____ 19____

Mr. _____ Address _____

Quantity	MATERIAL	Price	Quantity	MATERIAL	Price	Amount
	Plug fuse			Flush wall receptacle		
	Pull chain socket			Key wall receptacle		
	Key socket			Attachment plug		
	S P Flush wall switch			Amps Enclosed fuses		
	S P Snap switch					
	Hot Plate					
	Oven Unit					
	Pull Off Plug					

TROUBLE SERVICE DUE TO TROUBLE ON CUSTOMER'S PREMISES WILL BE CHARGED ON NEXT ELECTRIC SERVICE BILL.

Returned _____ No _____ In use since _____

REMARKS

Nature of Trouble _____ Material

TIME: Arriving _____ M. Leaving _____ M. TOTAL HOURS _____ (Minimum .30) 60 Labor

Troubleman _____ Total

Customer _____

Per _____

When a trouble man is employed, there is assigned to him a new car, or its equivalent, as will be explained later. These cars are equipped with box bodies with compartments to hold tools, line-working equipment, small line insulators and hardware, together with a stock of fuse plugs, switches and other devices and material for making repairs on customers' premises. The trouble men are equipped to work on hot lines up to 26,400 volts. The arrangement for car operation consists of the payment to the men of approximately 3½ cents per mile of travel plus $12.50 per month. The mileage allowance varies with the price of gasoline and tires. The company also pays public liability and property damage insurance on the cars and assumes the cost of repairs after accidents in which the driver of the car is definitely not to blame. Each car operator buys his own gasoline and other expendable supplies and pays for the cost of operation and maintenance of the car. When a man leaves the employ of the company or stops driving an allowance car for any reason, he is supposed to turn back his car in as good condition as when he received it, allowing for ordinary wear and tear. If the car requires repairs or new parts that should have been taken care of by the driver, he is billed for this expense. This scheme is carried out, even to making an allowance for tire wear, so that when the car is assigned to a new man and the tires have covered a considerable part of their expected mileage, the new man will have a credit already set up for him proportionate to the wear on the tires.

Procedure in Reporting to System Operator

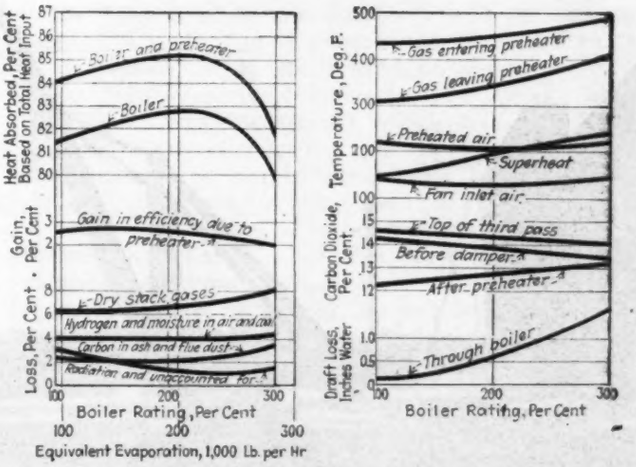
No total figures have been prepared of the different classes of calls which the trouble men answer, but during the year 1926 the grand total of all calls was over 102,000. These calls include the regular trouble work, calls on signs and street lights during the hours in which the men regularly engaged on such work are off duty, and system operations, such as opening and closing of pole-top switches and jumpering of lines for construction and maintenance crews to work on. When trouble men are used by the load dispatcher his instructions are given direct, but with the trouble foreman listening in on the conversation and making a written record of the order. When the load dispatcher has completed his instructions, he goes off the line and the trouble foreman talks with the man outside, usually speaking in some way of the work to be done, but not referring to the load dispatcher's instructions. That is to say, the foreman will see that the man knows how to reach the location of his work in the least possible time, but the principal purpose of this is to assure the man that his immediate superior knows what he is going to do and is familiar with the conditions involved.

When transmission lines are to be taken out of service to allow construction or repair work to be done the load dispatcher, to whom the original request is addressed, arranges with the trouble department for proper clearances if customers' service will be affected. The trouble men then secure the permission of customers for interruption of service during the period requested or arrange for supply over other lines. When distribution lines or substations are to be out of service, the general foreman in charge of the work to be done fills out and forwards to the trouble division the application for service interruption which is reproduced here. After the trouble department has secured the necessary clearances from customers, he returns a copy of the form to the man who has made the request with the notification that the line or lines will be dead during a specified period. Copies of this application go to the load dispatcher, to the sales department and to other construction or maintenance divisions that may wish to do work on the line while it is dead.

Work on Customers' Equipment

In making repairs on customers' premises use is made of pledge cards in which the customer agrees to pay for material and labor charged to the job. For example, if the trouble man goes to a house and discovers that fuses are blown on account of a defective socket, he repairs or replaces the socket from the stock in his car and then secures the signature of the customer on the pledge card. The customer knows what material has been used and how long the man has been on the job. Time is charged only for the actual time during which the trouble man is on the customer's premises, no charge being made for travel time to and from the job. As may be noted from the form, the minimum time charge is 30 minutes. This pledge card is made in triplicate, the customer receiving one copy and two being turned in to the office. On the receipt of the signed card at the office new material is issued to replace that which has been used and the stock in the trouble man's car is thus kept at full count. If a trouble man neglects to secure the signature of a customer to this card, or to make one out, or gives any of his stock away, he is charged with the missing items when quarterly inspection of stock is made.

Air Preheaters Affect Performance and Design*



Heat balance performance curves boiler No. 20, Colfax Station, Duquesne Light Company

CO_2 and the draft loss performance curves for boiler No. 20 (Colfax)

HEAT BALANCE AND LOSS CURVES FOR PERFORMANCE BOILER 20 (COLFAX)

THE higher boiler efficiencies that have resulted from the use of preheating equipment have led to an increasing demand, on the part of power plant designers, for apparatus that will operate under unusually high temperatures. Stoker design has been affected and installations capable of handling air of a temperature of 500 deg. F. do not appear impracticable.

A limited amount of data is available concerning maintenance costs, in spite of the large number of installa-

*Abstract from serial report of the prime movers committee of the National Electric Light Association, 1927.

tions of this kind that have been made. The information compiled indicates that surface corrosion in the preheater when high-sulphur coal is used constitutes an important item.

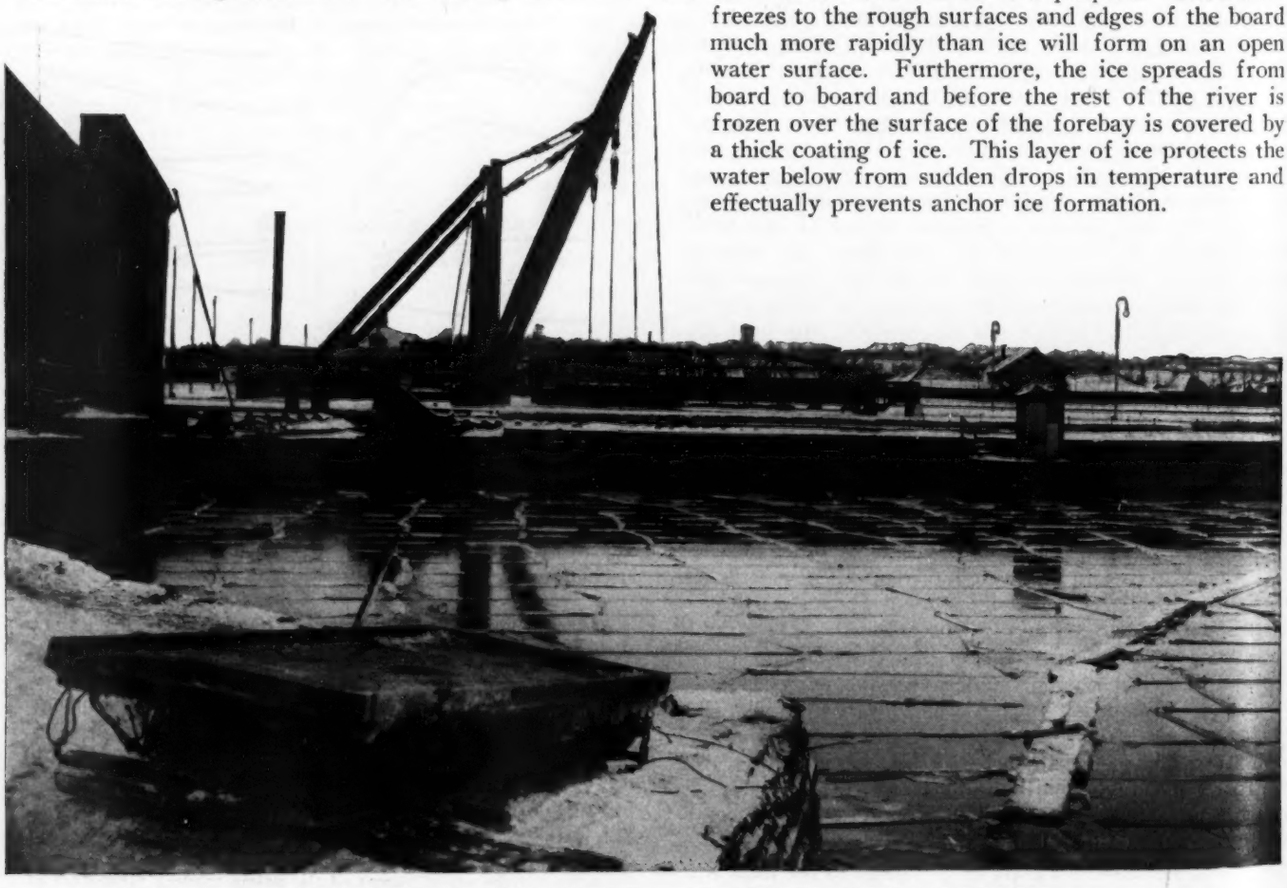
Representative performance curves, the result of tests made at the Colfax station of the Duquesne Light Company, are shown herewith. Design is such that all the combustion air is forced through the preheaters and delivered to the furnaces by variable-speed fans, except a small percentage, which is drawn through the burner boxes. The primary fan takes its supply from the preheated air duct connecting the preheaters and the furnaces. The quantity of secondary air required is regulated by varying the speed of the secondary fan, whereas the amount delivered to the different zones of the furnace is controlled by spring-loaded dampers at the entrance to the several ducts leading to the air lanes in the front walls.

Prevention of Anchor Ice

ANCHOR ice was at one time a serious operating difficulty at the hydro-electric plant of the Edison Sault Electric Company, Sault Ste. Marie, Mich., but preventive measures have been provided that have been very effective. The anchor ice, which formed whenever the surface water became superchilled but did not freeze on account of its own movement, adhered to the iron trash racks, turbine wheels and other iron parts and caused loss of power and nearly caused shutdown of the plant on some occasions.

A number of log booms have been strung across the forebay to prevent large floating masses from reaching the trash racks. When cold weather is imminent a large number of 1-in. cedar boards (from 6 to 12 in. wide) are lashed between the booms so as to divide the surface of the forebay into rectangular pools having relatively small surface movement. These cedar boards are not finished lumber, but are taken as they come from the mill saws; the more slivers and the rougher the surfaces the better the boards are for the purpose. The water freezes to the rough surfaces and edges of the board much more rapidly than ice will form on an open water surface. Furthermore, the ice spreads from board to board and before the rest of the river is frozen over the surface of the forebay is covered by a thick coating of ice. This layer of ice protects the water below from sudden drops in temperature and effectually prevents anchor ice formation.

ANCHOR ICE FORMED ON A TRASH RACK ABOUT 6 FT. BELOW THE SURFACE BEFORE PREVENTIVE MEASURES WERE ADOPTED



FOREBAY OF THE PLANT, SHOWING ICE COVERING PROMOTED BY GRID OF CEDAR BOARDS

Accounting Treatment of Depreciation

Utilities in the past have failed to provide accurate records of invested capital. An analysis is here given of a method devised for exact accounting

By Luster L. Starrett
Commonwealth Edison Company

UTILITIES in the past have failed miserably to maintain complete and accurate records of their invested capital. Expenditures for fixed assets were made and recorded in lump sums. It was not long until the lump sum accounts were impossible to analyze; as a result the utility had no idea as to the definite property it controlled.

B. S. Rodey, of the United Electric Light & Power Company, defines fixed capital records in the following manner: "Fixed capital records denote a continuous inventory of physical items of plant and property found worthy of record by local conditions, together with their original costs, which include material purchased, labor to install and miscellaneous contingent and overhead expenses, that in the total will agree with and support the fixed capital book figures."

He also sets forth the essentials of fixed capital records as:

1. The minimum practical and logical subdivision of the property as an item or items to represent the cost and identify the investment.
2. The quantity and description of the items.
3. The geographical location of the items.
4. The engineering and accounting classification of the items.
5. The identification with the job orders or contracts, under which the items were acquired, to substantiate cost and ownership.
6. The cost of the items, which includes material, labor and miscellaneous contingent and overhead expenses necessary in their construction.

Under the system used in the old construction ledger there was no way of telling the status of the property at any particular time. Fixed capital records show the exact condition of the property at a given time, depending upon the job ledger for the building up or reduction of the cost.

Much confusion has resulted in the use of the word "depreciation." In order to avoid this the utilities have eliminated the word "depreciation" from their accounts and in its place have substituted "retirement expense" to represent the charge to operation and "retirement reserve" to represent the reserve credited. This change was recommended by the National Association of Railway and Utilities Commissions. The courts, however, still cling to the use of the word "depreciation" with or without qualifying adjectives.

In order to understand the accounting procedure of depreciation it is necessary to be familiar with the text of each account. W. H. Hammond, chief accountant of the Illinois Commerce Commission, gives the following description of the accounts used in depreciation accounting for utilities:

No. 782—*Retirement Expense.*— An operating expense account, to be charged with the amount of estimated accruing depreciation.

No. 503—*Appropriations to Reserves.*—A profit and loss account, to be charged with such amounts as may be appropriated from surplus and credited to account 251, retirement reserve.

No. 251—*Retirement Reserve.*—A balance sheet account, to be credited with amount charged to accounts 782 and 503, when the charge to 503 is for depreciation: to be charged with cost of retired property, less salvage, etc.

No. 124—*Replacement Fund.*—A balance sheet account. If such fund is created, this account includes assets represented by the retirement reserve.

No. 132—*Property Abandoned.*—This account is intended as a suspense account, which shall include the retirement loss—that is, the original cost, estimated if not known, plus cost of dismantling less salvage on property destroyed or abandoned because of replacement, of obsolescence, of an extraordinaray casualty or for any other reason, when such loss has not been provided for in advance through a reserve. Amounts thus charged shall be amortized through annual or more frequent charges over a definitely determined period to such accounts as shall be proper.

Methods of Determining Depreciation

There are a great variety of methods used today in arriving at a correct depreciation figure. For as many different methods of depreciation there are equally as many different conditions surrounding the particular plant. What might work in one locality would be entirely wrong in another and the methods employed by an old established company could never be applied to the utility just starting in business.

There are three distinct types of utilities which employ different methods of depreciation. The first is the new utility the earnings of which are not certain and as a result must rely upon managerial opinions as to the amount to be set up in the retirement reserve. The second type of company is the one that has stable earnings but the records of which have not been kept in a scientific manner. This utility resorts to the so-called "production" method of setting up its reserves. The

third type of utility is the one that has stable earnings and also has a complete fixed capital record system. This utility can safely use the "straight-line" method of depreciation.

It can readily be seen that the three companies portray stages of the development process. The third example, the company that used the "straight-line" method of depreciation, has more or less reached a final goal in the art of retiring property, it being the most scientific of the three.

The "straight-line" method of depreciation is used extensively by industrial firms, but as yet the utilities have not made a practice of retiring their property in this manner. It is necessary, at the time of installation, to know the exact life, or approximate life, of the equipment installed. The total cost of the equipment is then written off on a prorated basis depending upon the estimated life and the forecast salvage value. The following formula may be used to arrive at the desired "straight-line" depreciation figure:

$$Depreciation = \frac{Cost\ Minus\ Salvage}{Estimated\ Life}$$

An Example.—A utility buys boiler equipment at a price of $100,000, which is estimated to last ten years and will at that time have a salvage value of $10,000:

$$Depreciation = \frac{\$100,000 - \$10,000}{10} = \$9,000 \text{ per year}$$

Accounting Entries:

Account 313 boiler	$100,000	
111 Cash		$100,000

To show the purchase of boiler plant equipment.

Account 782 retirement expense	9,000	
251 Retirement reserve		9,000

This account will be charged in the same manner for ten years, thus accumulating $90,000 in the retirement reserve account.

At the end of ten years:

Account 111 cash	$10,000	
251 Retirement reserve	90,000	
313 Boiler plant		$100,000

This entry shows the salvage value plus the amount accumulated in the retirement reserve as set against the removal of the boiler equipment from the fixed capital records.

Account 111 cash	$10,000	
251 Retirement reserve	40,000	
132 Property abandoned	50,000	
313 Boiler equipment		$100,000

To show the setting up of the property abandoned account when the account 251 is not large enough to make such a retirement as shown. The property abandoned account is amortized over an agreed number of years.

The weakness of the "straight-line" method of depreciation as applied to the utilities is that the life of the equipment is difficult to estimate. Just what determines economic death to a piece of property may cause controversy in that some equipment may have indefinite life. Other equipment may be removed in a short period after installation due to improvements, making it uneconomical to remain in service.

The "sinking-fund" method operates in close relationship with the straight-line method except the way in which the retirement fund is accumulated. The "sinking-fund" method allocates a certain amount to be placed in a cash fund, which draws interest and is not used in the business. The estimated fund to be needed to retire the property takes interest and salvage value into consideration as well as the expected life.

Under the working-hours method the life of equipment depends upon the continuity of service it renders and over-use tends to lessen its life. The fact that the equipment is being used more at one period than at another gives the overtime period the greater use of the asset. To avoid this situation the depreciation is set up according to the number of hours in operation. The estimated life is thus in terms of working hours rather than in years, as in the "straight-line" method.

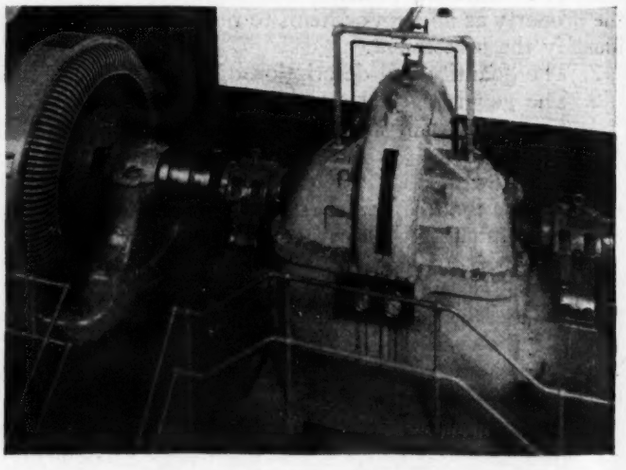
The production method is similar to the working-hours method and is being used extensively in public utilities. A certain rate per unit of production is determined and applied to the production during the accounting period. Utility accountants use the kilowatt-hour as a basis. Many accountants contend that the retirement charges should be less in the latter period of the useful life of the equipment, for in this period the repairs and maintenance charges are the greatest. It is assumed that the repairs will increase in the same proportion as the retirement decreases, which is purely a theoretical assumption.

In the appraisal method no charges are made to write off the equipment until the end of its useful life. At this time the equipment to be written off is appraised and the value is assigned to be deducted from the original cost. The figure thus arrived at is taken from the reserve account, thus throwing a heavy burden upon one accounting period.

There is a danger of neglecting the principle of using going-concern value by allowing market fluctuations to enter.

High-Efficiency Pump for Detroit Water Works

THE centrifugal direct-connected electrically driven pump shown is one of two recently installed in the Detroit Water Works. This pump has a capacity of 50,000,000 gal. daily when operating against a head of 170 ft. Unit test efficiency of the pump and motor is



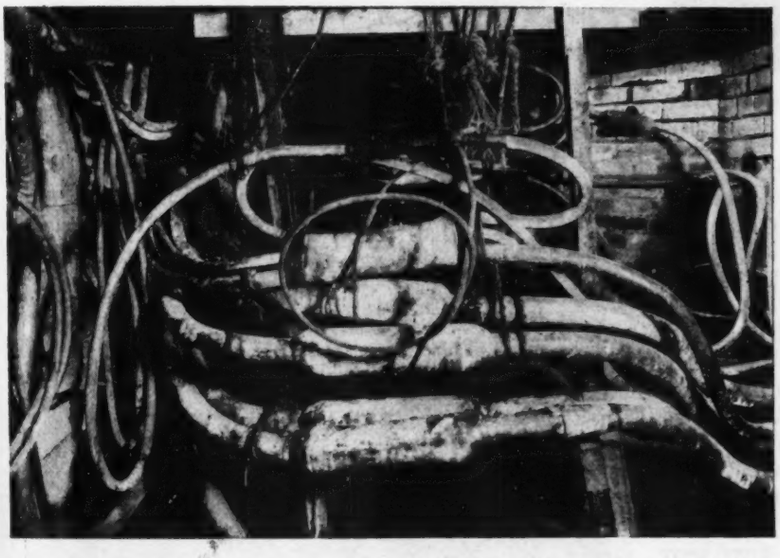
PUMP DRIVEN BY 2,050-HP. SYNCHRONOUS MOTOR

84.7 per cent, according to the manufacturer, the Worthington Pump & Machinary Corporation. A synchronous motor rated at 2,050 hp. with a direct-connected exciter is used. The other pump, installed at the same time, has a daily capacity of 70,000,000 gal. and is driven by a 2,600-hp. motor, which is reported to be the largest, in point of horsepower, to be devoted to water-works use. The new pump replaces steam-driven equipment of smaller capacity. The daily pumping capacity of the city of Detroit water works is now 435,000,000 gal. daily, or about 350 gal. per capita.

Space for Cable Splicing and Racking Essential

By J. M. Gillham
Superintendent Underground Department Portland (Ore.) Electric Power Company

GROWTH of load in underground districts frequently makes it necessary to enlarge manholes to provide space for additional conduit lines and cables. In such cases careful consideration should be given to the direction in which the manhole is enlarged in order that proper space shall be available in the new manhole for splicing and racking heavy cables. An example of the wrong way to enlarge a manhole is shown in Fig. 1, and the resulting condition of cables is shown in the accompanying photograph. It will be seen that the greatest length of the enlarged manhole was in a north and south direction, whereas heavy cables from the station crossed the hole in the opposite direction. This resulted in the bad cable condition shown in the south end of the hole.



CABLE CONDITION RESULTING FROM ENLARGING MANHOLE IN WRONG DIRECTION

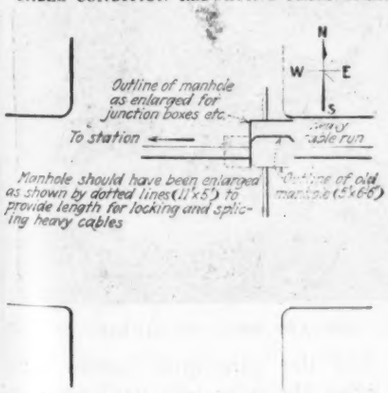

N
W
E
S
Outline of manhole as enlarged for junction boxes etc.
To station
Heavy cable run
Manhole should have been enlarged as shown by dotted lines (11'x5') to provide length for racking and splicing heavy cables
Outline of old manhole (5'x6')

FIG. 1—HOW A MANHOLE WAS ENLARGED AND HOW IT SHOULD HAVE BEEN DONE TO AVOID CABLE CONGESTION

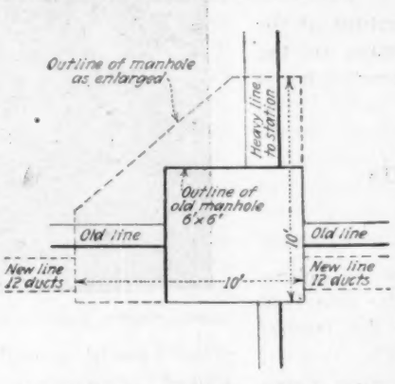


FIG. 2—CABLE SITUATION WHICH MADE IT DESIRABLE TO BUILD ENLARGED MANHOLE WITH ONE DIAGONAL WALL

Another case in point is the enlarging of an old 6-ft. x 6-ft. manhole to accommodate a new twelve-duct subway. From Fig. 2 it will be seen that heavy station cables made a right-angle turn in the manhole, and in order to decrease the curvature of bends and provide ample splicing and racking room, the manhole was enlarged as shown.

Sometimes it is impossible to build a manhole of ideal dimensions or enlarge it as desired on account of underground obstructions, but a careful study of conditions and an application of sound cable engineering principles will usually avoid such undesirable situations as that shown.

Synchronous Motor Also Serves as a Generator

By M. H. Russell
General Electric Company, Cincinnati, Ohio

A 75-HP., three-phase synchronous motor recently installed at the Baton Rouge (La.) plant of the Mengel Company is designed to operate as a motor under normal conditions and as a generator for emergency operation.

As a generator this machine furnishes alternating current to the company's plant when the main 1,000-kva. generator is not running. This is necessary, as there are several alternating-current motors used to operate dry kilns, water service pumps, etc. By having a small alternating-current generator available, the necessity of using duplicate direct-current motors to operate this equipment is avoided.

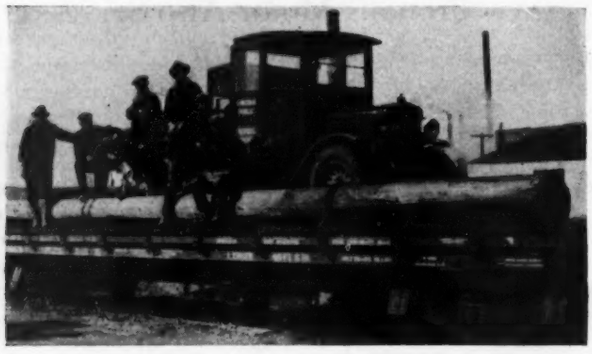
An interesting method of control has been developed for this machine. The equipment consists of a semi-automatic reduced voltage starter mounted alongside of and at one end of the main switchboard. The simplest form of control was desired and this standard starter, with a few modifications, was found satisfactory, the only additional equipment required being a triple-pole, double-throw lever switch of the usual type.

When the double-throw switch is in the position for motor operation, the connections are the same as for the standard starter panel and are arranged for semi-automatic operation. When the machine is to be operated as a generator, it is started up and driven at rated speed, after which the triple pole, double-throw switch is placed in the generator position, causing the field contactor to close immediately, this in turn causing the generator to build up normal voltage. When the voltage has been adjusted by the rheostat, the compensator handle is thrown first to starting position and then to running position, where it will latch for motor operation. The double-throw switch, when in the position for generator operation, opens the auto-transformer connections in order that a high voltage will not be imposed on the outgoing line while the starting handle is in the starting position.

The arrangement as described has proved highly satisfactory, has reduced investment charges for new equipment, has conserved space and has increased the flexibility of plant operation.

Flat-Car Pole Setting

ONE of the poles in the 22,000-volt transmission line of the Nebraska Gas & Electric Company between Lincoln and Seward was in the path of a transfer track to be built between the Union Pacific and Chicago, Burlington & Quincy railroads. The pole was in low land, which after a ten days' rain had become practically a swamp. The track grades of the two railroads are a number of feet above the general level of the ground in



LINE TRUCK AND POLE LOADED ON FLAT CAR

which the pole was set, but since they were both single tracks, it was impossible to drive the line truck along either one of them. The soft condition of the surrounding ground made it impossible also to bring the truck through the field.

However, these difficulties were surmounted. The line truck was run up on a flat car and blocked securely in place. The new 55-ft. pole was loaded on the car also. The truck was equipped with a winch. From this a steel cable was carried out in front of the car to its full length and on the track and secured at its free end. Then by means of the winch the truck was enabled to propel the loaded flat car along the track. Using this means of propulsion, the outfit reached the point where the new pole had to be set. The pole was then rolled off the car and set about 25 ft. from the old one, the lines were transferred and the old pole was removed.

The time which elapsed between the departure of the truck from the railroad yard and the closing of the switch when service was restored on the line was 3 hours and 45 minutes.

Caisson Progress Records

By C. H. Dickinson
Construction Bureau, The Detroit Edison Company, Detroit, Mich.

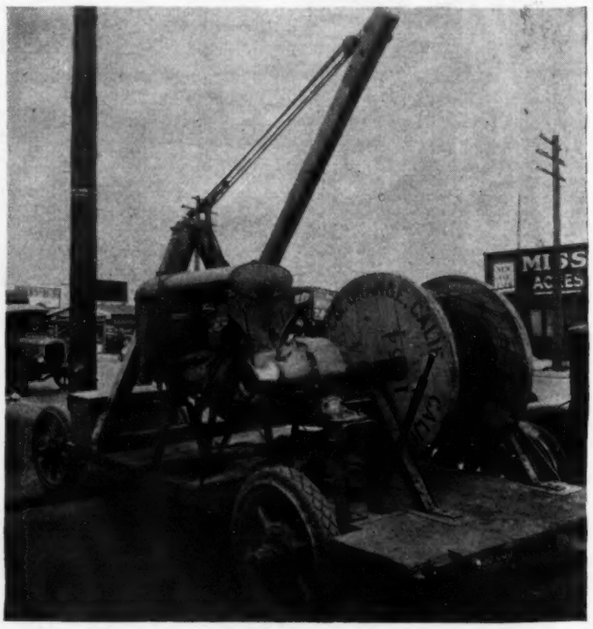
IN ORDER to keep track of the progress in sinking the 103 caissons for the foundation of the first construction unit of the new Delray plant of the Detroit Edison Company, two charts are used. The first of these is drawn on large sheets of cross-section paper and consists of columns about ¼ in. wide (to represent the caissons), which are extended downward on the paper as the caissons go down. Each morning there is added to each column sections proportionate in length to the distance the caisson was lowered by the previous day and night shifts, and a notation of the date is made at the side. The sections of the columns are of seven different colors, representing cinder fill, soft clay, hard clay, hard pan, sand, quicksand and bed rock. Each column represents one caisson, identified by number, and as the colors are filled in, the soil conditions in each instance are shown. From a glance at this chart it is possible to ascertain just how far each caisson has gone down, how much was done in any shift and what soils were encountered. When the concrete is poured in a caisson, the completion of that unit is indicated by a thick line drawn parallel to the particular column on the chart.

The second chart is a plan. Each row of caissons is lettered and each caisson is numbered in the rows, the combination of number and letter identifying any caisson in the previously described chart. The progress of work is indicated by concentric colored circles, one color representing that the sheet piling is in the hole, a second that the forms are in, a third that the concrete is poured, and a line crossing the circles indicates that the sheet piling has been pulled out. The last symbol furnishes information as to the amount of piling available for the other holes.

Tractor Engine Drives Take-up Reel

By H. L. Caldwell
Executive Assistant to Distribution Engineer,
Bureau of Power and Light,
Los Angeles, Cal.

VARIOUS methods have been used in removing sections of wire, the usual procedure being to pull the wire out on the ground and then either coil it or reel it from the ground. This has always been an expensive method, as it involves all hand work. The coils or reels



POWER-DRIVEN REEL SAVES TIME AND PREVENTS KINKING OF WIRE

were loosely wound and the wire quite often badly kinked, consequently when the wire was used again it involved additional expense in restringing.

The accompanying illustration shows the method devised by the Bureau of Power and Light of Los Angeles, to overcome these difficulties in removing sections of overhead wire or changing the size of copper on an overhead line. It consists of a 3½-ton New Comer trailer, on which is mounted a standard Fordson tractor engine that drives the spindle to which the standard reel is attached. A hoist is also provided so that the reel may be removed in the field. There is great saving in time in removing or replacing wire by this method.

What Does It Cost?

N.E.M.A. committee develops uniform cost system—Its use will enable the correct determination of costs with due regard for all the factors involved

By S. L. WHITESTONE and F. H. CORREGAN

STANDARDIZATION or uniformity in cost accounting is essential if statistical data pertaining to the industry are to be of value. In using a uniform system of cost accounting its value does not rest alone in the fact that a particular accounting or cost transaction will be treated in precisely the same manner by all companies. The work has a broader, more far-reaching and important object. Standardization presupposes a better, surer and more profitable way of accomplishing a result, and when concerted action is directed toward it mutual benefit is sure to be derived. There is a better way of handling accounting and cost work, which can be developed only by a full and detailed discussion of the problems involved. Although very marked progress has already been made, the ultimate goal has not yet been reached, and may never be, because, as in the case of engineering, manufacturing and distributing, we learn as we go. Furthermore, as new developments occur in those fields the accounting and cost work must be brought into line. Changes in economic conditions also have to be met.

Considering that the electrical industry embraces a great variety of products manufactured and distributed under widely differing conditions, it might seem that complete standardization of accounting and cost methods throughout is unattainable, and so it is. However, just as there are fundamental engineering principles pertaining to a particular class of product and several manufacturers may apply these principles in as many different types of construction, so in the case of accounting and cost problems there are fundamental principles which should govern the treatment of each class of transaction. The application of these principles, as in the case of engineering, is a matter for industrial discretion.

THE ACCOMPANYING PAPER treats the subject of cost accounting in the language and from the point of view of a business executive. Cost accounting is a subject with which too many executives are unfamiliar, just as in many cases they are unfamiliar with certain highly technical processes which may be part of their business. Executives are interested not so much in the mechanism used to obtain certain figures and results as they are in the figures and results themselves. This is, of course, a natural and necessary condition, and provided that the system they are using is entirely adequate for the functions it is called upon to perform, there is nothing further to be desired.

There are in existence many concerns in which the accounting system used is not so complete as it should be and does not present a clear and definite view of the actual operations of the plant and their significance. Under given conditions there are really only three items which may be varied by the manufacturer. They are manufacturing costs, selling price and amount of profit obtained. If any two of these items are fixed, they determine the third one. The effect of this interdependence is not so fully appreciated as it should be in the industry.

If a certain manufacturer claims that the price at which he may sell an article is determined by competition and that his manufacturing costs are as low as he can get them, then his profit is evidently fixed. If the selling price has been determined and the manufacturer decides that he must make a certain profit, the only way he can do it is by adjusting his manufacturing costs to a point where this is possible. If the manufacturing costs is fixed and a certain profit is to be obtained, then the selling price must be adjusted to make this possible. It is never a simple matter to determine the exact cost of a manufactured article, and unless the system used in determining the cost is properly organized and takes into account all of the various items from direct labor to amortization, it is inevitable that sooner or later the forgotten items will present themselves for settlement. This paper sets forth very clearly the inexorable nature of the economic laws which come into play and is worthy of the careful study of all manufacturing executives.

The complete revision of the accounting system of a manufacturing organization is not a task lightly to be undertaken. It requires expert treatment and the application of principles which have been proved by years of successful operation. Accounting departments in manufacturing organizations do not normally take upon themselves the revision of their methods—such revisions, when they occur, are usually a result of executive action. There is no more fundamental duty of the executive than to assure himself that his accounting methods are completely adequate.

ALFRED E. WALLER,
Managing Director,
National Electrical Manufcaturers' Association.

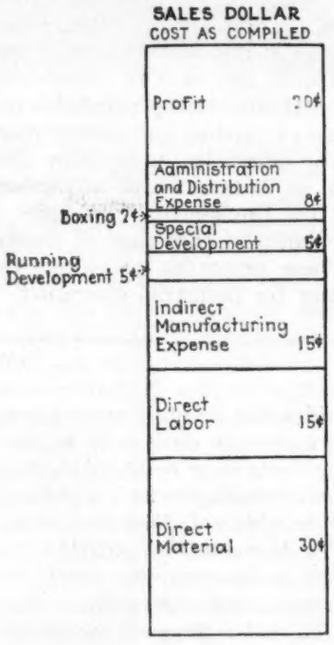
As the development and application of engineering principles must result in a valuable finished product, so are there definite requirements of an effective standard accounting and cost system. The requirements are:

1. A complete and comprehensive record of financial transactions so that all property will be fully accounted for and adequately safeguarded and so that the balance sheet will be a true presentation of assets and liabilities.

2. A detailed classification of expenditures and other financial transactions as an aid in effectively controlling all activities of the business.

3. A method of allocating expenditures accurately to the products to which they are applicable, for the purpose of determining total costs per unit and profit-and-loss results by lines of products.

4. The determination of the capital employed in the manufacture and distribution of each class of product, as a basis for deciding upon the net margin to be added to total cost if a fair minimum return upon the investment for each line is to be assured.



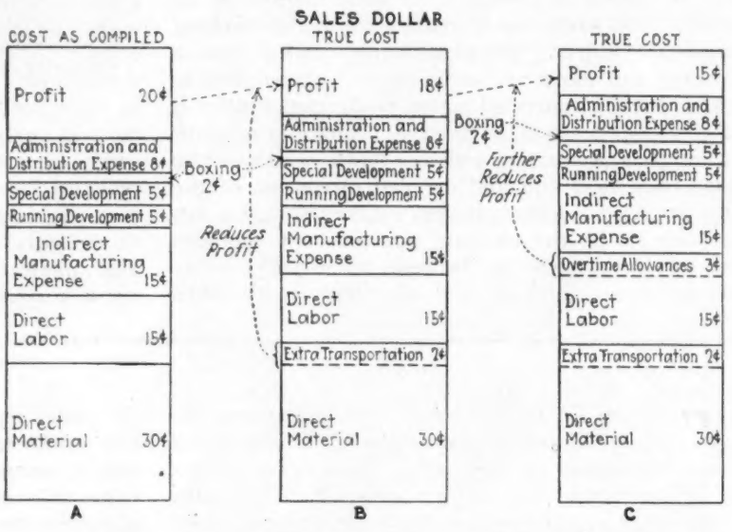


FIG. 1 (AT LEFT)—ELEMENTS OF COST. FIG. 2 (ABOVE)—SPECIAL TRANSPORTATION AND OVERTIME LABOR AS APPLIED TO COSTS

5. Uniformity in the presentation of statistical data, so that they will be intelligible and conclusive.

The "Standard Accounting and Cost System," as it stands today, goes far toward meeting those requirements. There is, however, opportunity for further improvement through concerted study of important problems, and for an extension of the adoption of the principles outlined in the system. Specific cases, herewith presented, demonstrate how the work of the committee on standardization of accounting and costs can be for the benefit of any and all members of the industry. The cases presented, although hypothetical, were not drawn from imagination. They are representations of conditions which have been found to exist. Their presentation shows that important problems do exist, and they stress the importance of an exchange of ideas.

Relation of Profit to Investment

The financial success of a business cannot be judged by the amount of its profit nor by the magnitude of its investment. It is the relation which the profit bears to the investment that is significant. There are two separate but not distinct problems to be dealt with—one, the cost of the product; the other, the capital investment employed. A truly effective accounting and cost system will afford means for determining each with a practicable degree of accuracy.

The question of capital investment and return thereon is a fundamental problem of great importance to the welfare of the industry at large, and one which has the possibility of uniformity of treatment within reasonable and acceptable bounds. Although the inclusion of interest in costs is not advocated, the definite inclusion in selling prices of at least a fair, normal or average minimum return on capital investment is necessary. This problem involves definite consideration of:

1. The normal capital investment for individual lines of products—in some cases for the types included within a broad line—and the rapidity with which the investment for each line or type may be turned over.

2. The amount or rate of return or net margin on the total investment, which must be adequate to provide for: (a) the payment of a uniform rate of dividend year after year throughout a cycle of business conditions; (b) reserves out of which unexpected losses may be met; (c) surplus which can be made available for the expansion of the business.

Capital Investment

The rate of return on investment is not the primary point involved, but that point is the importance of correctly allocating capital investment to lines of product as a basis for including a proper allowance in selling prices. Capital investment for the purpose of determining the net margin to be provided for in selling prices is composed of assets actually employed in manufacturing and distributing products. They are:

1. Fixed assets at cost.
2. Inventories at cost or market, whichever is lower.
3. Receivables.
4. Cash.
5. Securities which are readily convertible and which represent working capital temporarily not required in other forms.

6. Patents (at cost or utility value).
7. Unliquidated development expenditures.
8. Other deferred charges.
9. Less accounts payable and other non-interest-bearing current liabilities (which are really free capital made available by the comity of business, offsetting, at least in part, similar capital made available to others).

The importance of allocating capital investment to lines of product with reasonable accuracy as a basis for intelligent determining a fair profit allowance to be included in selling prices may be illustrated by the following:

A company manufacturing two lines of products has an average turnover of capital investment of two times per annum and, wishing to earn 10 per cent per annum, has been figuring on a net margin of 5 per cent on the total cost for both lines. The price of product "A" is higher than that of the company's competitors, while product "B" meets with little price competition. An analysis of capital investment discloses the facts shown in Table I herewith.

TABLE I—ANALYSIS OF CAPITAL INVESTMENT
(By lines of product)

	Total	Product "A"	Product "B"
Capital investment	$100,000	$20,000	$80,000
Cost of sales	$200,000	$120,000	$80,000
Turnover, times	2	6	1
Percentage net margin provided for in selling prices		5	5
Desired return on investment, in per cent	10	10	10
Required percentage net margin		1⅔	10

It will be noted that the capital investment for product "A" is smaller in relation to the cost of sales. It involves the use of few and inexpensive plant facilities, the raw materials entering into it are of a standard character which can be obtained as required, and the finished product is promptly disposed of. The investment for product "B" is larger because it requires expensive tools, is made of special raw materials and is in process of manufacture for several months. Second, the turnover for product "A" is six times per annum and for "B" only one time. Third, satisfactory profits will be realized if an allowance of 1⅔ per cent for net margin is provided for in the selling prices of product "A," but 10 per cent must be figured in the case of "B." The seriousness in such a case lies in the possibility that a price level may have become established for product "B" to the detriment of the particular company and perhaps the industry at large. Other cases illustrating problems of return on investment might be presented, such as the effect of using cash discounts to obtain a reduction in the cost of materials without regard for the additional investment necessary to permit of paying invoices in advance.

The Sales Dollar

The importance of correct cost methods may be demonstrated by a few representative cases. For the purpose of presentation it is assumed that a cost has been compiled following a company's usual procedure and that, using it as a basis, a selling price of one dollar has been determined upon. This is made up as shown in Fig. 1. The elements of the cost are those adopted by the electrical manufacturing industry. These elements are not purely theoretical; they are wholly practical and essential. Each one is significant and is dictated by distinct circumstances or conditions having an influence on the control of expenditures and the accuracy of costs. As pointed out before, an effective system must have for its purpose both the control of expenditures and the correct allocation thereof to the products to which they are applicable.

Oftentimes it is remarked that there is no need for a cost system when selling prices are determined by competition. This viewpoint overlooks the important aid which an effective cost system renders in controlling expenditures, but, more than that, it fails to recognize that if selling prices cannot be determined with respect to costs, then costs must be determined with respect to selling prices. In the latter case the selling price is the limit of income, and by a reverse procedure, the amounts which may be expended for each element of cost are determined after first deducting from the selling price an allowance for a fair return on investment.

Direct Material

The "Standard System of Accounting" provides for the inclusion under the head of "direct material" only of materials represented in and traceable directly to specific units of product. Frequently certain expenditures are treated as material in the accounts, but not in costs, with the result that in the final analysis the profit item is found to be smaller than anticipated. This is illustrated in Fig. 2. Materials are included in costs at purchase prices plus regular freight rates. From time to time production requirements necessitate deliveries by express.

The charges for express service are treated the same as regular freight charges and entered into the material account, but are not provided for in costs. The result is that the expenditures per unit are as shown in Fig. 2, chart B, as compared with the cost as compiled, chart A, and the profit is smaller than anticipated. It would be difficult in many cases to account for intermittent charges for extra transportation as a material item. Therefore, the "Standard System of Accounting" provides for treating such charges as "unabsorbed transportation," a part of manufacturing expense, by means of which they are brought definitely to attention for the purpose of control and their inclusion in costs is made more certain.

Direct Labor

What has been said in general regarding direct material applies also to direct labor. A case in point will, however, stress the importance of correct methods. Overtime allowances paid to direct workers afford a good example of how faulty treatment may result in smaller profits than were anticipated. Because such allowances are not always with us, at least to the same extent, unless specific provision is made for dealing with them when they do occur, they may follow regular wages into the direct labor account and be lost sight of, thus giving rise to ineffective control and omission from costs. The effect upon profits of omitting them from costs is shown in Fig. 2, chart C.

The work of the committee on standardization of accounting and costs, of which S. L. Whitestone, comptroller of the General Electric Company, is chairman, was originally outlined in a report presented by F. H. Corregan, assistant general auditor of the General Electric Company, at the annual convention of the National Electrical Manufacturers' Association, June, 1927. The development of a uniform cost system as outlined by Messrs. Whitestone and Corregan in this article is being presented in two parts. Part II will appear in the issue of Electrical World for Sept. 17.

Securing the Public's Confidence

PUBLIC utilities will save themselves much public criticism and misunderstanding by offering to tell all the facts—good and bad—regarding situations that have acquired or may develop public interest. By so doing, they will deprive uninformed and disgruntled persons of the opportunity to say publicly: "Here is a situation that utility is trying to conceal." That is the conviction of one utility executive, who recently related the following incident:

"Once I had occasion to tell a newspaper reporter the facts connected with a street-car accident. The facts were against the company. 'But,' he said, 'this will hurt you.' It did hurt. But it was not the truth that hurt; the printed facts did not cost the company anything. I knew the facts would ultimately become known and the company would have to pay. From that time on that reporter never questioned the truthfulness of any of my statements, and as a result the company's news from then on was always welcome and was given the display it merited."

Acquiring public confidence is a simple matter, this executive contends, if the following procedure is adopted:

1. See that your own house is in order.
2. Take the newspaper fellows into your confidence.
3. Buy white space in as many newspapers as your appropriation will consistently permit.
4. Use that space persistently and stick to the truth.

Emphasis is given the newspaper for the reason that this official believes it affords the cheapest and quickest means of getting a utility's story to the people. A broad-minded editor appreciates the fact, he adds, that you are willing to tell your story to his readers through the advertising columns of his paper, instead of attempting to gorge the paper with a lot of so-called propaganda disguised as news.

One of the most serious errors that can be committed by a public utility is to attempt to "ride a newspaper without paying the freight." Information that must be conveyed to the public should be presented in space purchased at the regular advertising rates and the reporter asked to accept only such information as can and will be readily construed as legitimate news. No matter what the editorial attitude of a newspaper may be toward a company, real news will be given its rightful place in the news columns. When this is done, the fellow on the outside who wants to put the "public be damned" words into a utility's mouth will not find it quite so easy to get his "letter to the editor" printed at the top of the column with a display head.

"Putting your own house in order" is nothing more than seeing to it that the service sold to the public and the methods used in delivering and collecting for that service are such as will be acceptable to the ultimate consumer.

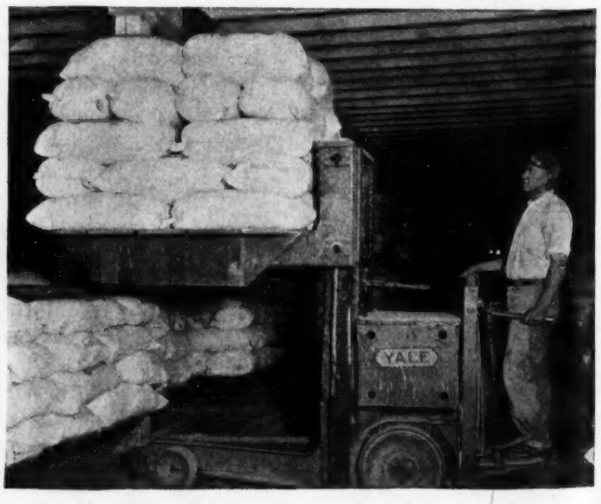
When the utility and the people it serves are more closely aligned in a common knowledge of their respective problems and aims; when the utility works the hardest and the public applauds loudest; when demagogues become aware of this bond of friendship and sympathy, then and only then, says the executive quoted, will "the public be damned" attitude attributed to corporations lose its force and meaning, thereby robbing the selfish and greedy office seeker of his greatest weapon and restoring public service to its rightful and essential place in the esteem and estimation of the man it serves.

Industrial Truck Solves Warehousing Problem

NOT only has an industrial electric lift truck enabled the Great Western Milling Company of Los Angeles, Cal., to utilize storage space to the utmost but it has saved the installation of a conveyor system and the labor of at least three men. The truck moves milled goods to and from the second floor of the company's mill, making an average of twenty trips a day over a 190-ft. ramp with 12 per cent grade with loads averaging 2,700 lb. Special loading skids permit the truck to load and unload its cargo readily and the lift feature makes it possible to pile sacks practically to the ceiling of the warehouse, saving in this one operation alone the labor of three men.

The truck is a Yale K22 industrial lift truck equipped with an 18 MVA-11 Ironclad battery and provided with a dynamic brake. The braking feature was added after the truck was purchased by placing back-contacts on the circuit breaker so that the motor, acting as a generator, is short circuited through the starting resistance when

INDUSTRIAL ELECTRIC TRUCK HAULS 1½-TON LOADS UP 12 PER CENT RAMP



WAREHOUSE SPACE IS UTILIZED TO FULL ADVANTAGE BY INDUSTRIAL ELECTRIC LIFT TRUCK

the brake pedal is held in any position other than that for taking power. Full release of the brake pedal brings into play the mechanical brake as well.

The truck, with the original battery, has been in operation for 3½ years and the manager of the plant states that the cost of charging amounts to only 13 cents per day and that maintenance on truck, battery and electrical equipment has been practically nil.

Power Factor, Load Factor and Demand Power Rate

Two watt-hour meters used. One is connected to measure kilovolt-ampere-hours. Power factor and load factor multipliers used to compute bill.

THE power rate developed by the Colorado Utilities Corporation has taken into account in a relatively simple manner power factor, load factor, and demand, and provided suitable credits and charges applicable to the individual customer. This has been done in such a way that the customer is encouraged to make his load such that he earns the best rate and in so doing makes it equally beneficial to the power company.

Metering connections for the rate as set up are simple, investment in metering equipment is a minimum and the amount of office work in computing bills is not complicated or extensive.

The rate is applicable to a definite nominated demand of not less than 50 kva. or more than 1,000 kva. The rate follows:

Demand Charge:
Per kilovolt-ampere of maximum demand per month.....$1.60
Plus

Energy Charge:
Total kilowatt-hours metered per month multiplied by load factor, power factor and primary metering multipliers per kilowatt-hour 0.015

Minimum Charge:
The minimum charge shall be the demand charge.

Delayed Payment Charge:
Five per cent will be added to all bills not paid within ten days of date of bill.

Maximum Demand:
Maximum demand shall be the nominated kilovolt-amperage except in those months that the highest integrated 15-minute peak exceeds the nominated kilovolt-amperage, for which months the maximum demand shall be the highest such peak for the month in which it occurs.

Multipliers Modifying Total Kilowatt-hours for Billing:
The total kilowatt-hours as metered will for billing purposes be multiplied by the multipliers below which apply and the net kilowatt-hours resulting after multipliers *a*, *b* and *c* have been used in succession will be used in computing the energy charge.

(*a*) *Load Factor Multiplier:*

Load Factor (Monthly), Per Cent	Multiplier	Load Factor (Monthly), Per Cent	Multiplier
95 to 100	0.60	20 to 24	1.00
75 to 94	0.81	15 to 19	1.30
50 to 74	0.87	Up to 14	1.50
25 to 49	0.95		

Load factor will be taken as the ratio:

$$\frac{\textit{Total kilowatt-hours metered per month}}{\textit{720 hours} \times \textit{maximum demand kilovolt-amperage}}$$

(*b*) *Power Factor Multiplier:*
Rate is based upon maintenance by the consumer of an effective power factor of 85 per cent for each month, as shown by integrating instruments.

Effective Monthly Power Factor, Per Cent	Multiplier	Effective Monthly Power Factor, Per Cent	Multiplier
100	0.95	70	1.083
95	0.96	65	1.1255
90	0.98	60	1.1785
85	1.00	55	1.2455
80	1.023	50	1.335
75	1.050		

Power factor will be taken as the ratio:

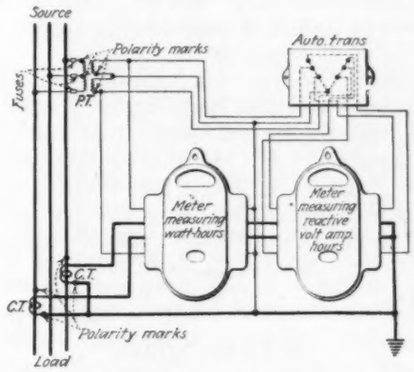
$$\frac{\textit{Kilowatts}}{\textit{Kilovolt-amperes}}$$

and will be used for computing multipliers for power factors less than 50 per cent.

Reactive factor meters will be equipped with ratchet stops to prevent reverse registration.

(*c*) *Primary Metering Multiplier:*
This rate is based on delivery of transformed energy. When measurement of energy is made at the primary voltage of the transmission line used to supply the consumer, the multiplier shall be 0.95.

Allowance for Consumer Ownership of Substation:
When the consumer furnishes and maintains the complete substation equipment, including transformers, switches, supporting structures and other necessary equipment, together with all



METERING CONNECTIONS FOR KILOWATT-HOUR AND KILOVOLT-AMPERE-HOUR METERS USING AUTO-TRANSFORMER FOR CAUSING VOLTAGE TO LAG 90 DEG.

wiring, and a suitable inclosure for the company's metering instruments and devices (exclusive of metering instruments and devices), all in accordance with the company's specifications and approval, so that the consumer may take service at the voltage of the primary transmission system from which the consumer is to receive service, the following credit will be deducted from the demand charge when computing the monthly bill:

Voltage	Size Kva. Substation	Credit Kva. of Max. Demand
6,600 to 11,000	50 to 200	$0.20
	200 and above	0.18
13,200	50 and above	0.22
	50 to 600	0.30
44,000	600 and above	0.22

Metering

The only metering equipment required with the above rate is two watt-hour meters, one meter being provided with a 15-minute combined demand indicator and register. A standard metering transformer consisting of two auto-transformers in a single case lags the voltage 90 deg. behind the current and makes possible the determination of the reactive component of the load in kilovolt-amperes by the use of a standard polyphase watt-hour meter. Metering connections are shown in the accompanying diagram. From the reading of the watt-hour and the kilovolt-ampere-hour meters, the average power factor for the month is determined. For conditions of highly fluctuating, variable power-factor loads, Westinghouse R. I. meters which register the total kilowatt-hours and kilovolt-ampere-hours direct are

used. This meter also charts the kilowatt and kilovolt-ampere demands at 15-minute intervals.

Detailed computation of a typical bill where the kilowatt-hour and the kilovolt-ampere-hour meters are used is as follows:

Contract demand in kilovolt-amperes	300
Consumption according to kilowatt-hour meter	54,400
Consumption according to kilovolt-ampere-hour meter	67,200

Load factor multiplier:

$$\text{Load factor} = \frac{54{,}400}{720 \times 300} = 25.2 \text{ per cent.}$$

From table in rate schedule, multiplier = 0.95.

Power factor multiplier:

$$\text{Power factor} = \frac{54{,}400}{\sqrt{54{,}400^2 \times 67{,}200^2}} = 62.9 \text{ per cent.}$$

From table in rate schedule, multiplier = 1.1785.

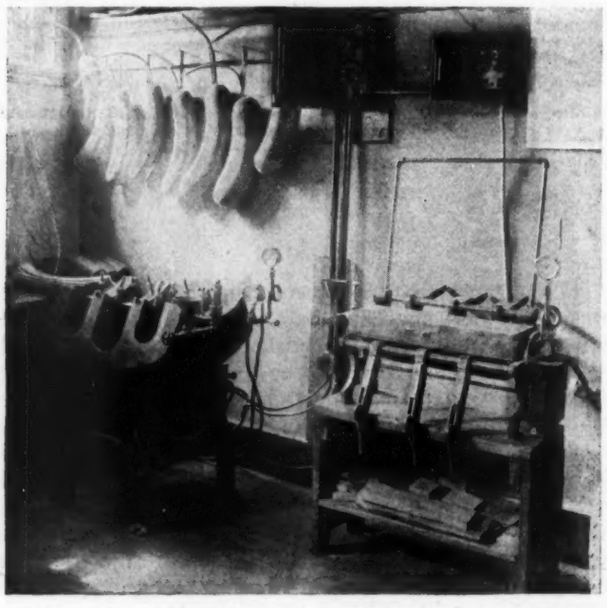
Demand charge = 300 kva. at $1.60 =	$480.00
Energy charge = 54,400 × 0.95 × 1.1785 × 0.015 =	913.58
	$1,393.58

Application of the primary metering multiplier and credit allowance for customer ownership of substation are self-explanatory and are not included in the above example. Computation of power factor is ordinarily accomplished by means of power-factor tables, the above being merely to show the detailed method.

The Colorado Utilities Corporation gives due credit to the following men and corporations for information obtained through papers and books, from which the above rate was prepared: H. M. Sawyer, Wagner Electric Corporation; Charles R. Underhill, Westinghouse Electric & Manufacturing Company, and H. B. Dwight, engineer of the Colorado Public Utilities Commission.

Better Product and Working Conditions in Less Space

WORKING conditions in the rubber-tire vulcanizing field have been greatly improved by the adoption of electric heating in place of steam and gas. The illustration shows a three-cavity, 6-kw., Lowell tire vulcanizer at the left and an 1,850-watt Lowell tube vulcanizer at the right in the shop of Brophy Brothers, Boston, Mass.

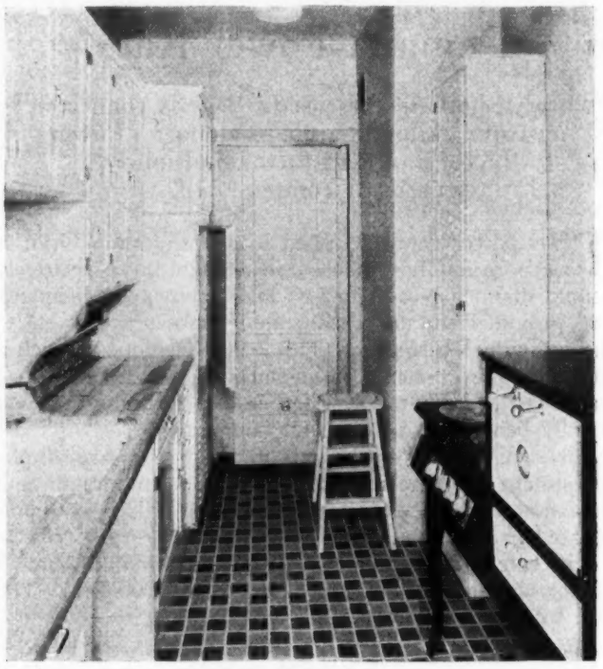


ELECTRIC HEATING SYSTEM CONSERVES SPACE IN VULCANIZING PLANT

Formerly gas-heated vulcanizers were used here, and trouble arose from the frequent burning of tires by the open flame, while the heat wastage made the working conditions most unsatisfactory. The space economy of the electrical equipment has proved to be one of its chief advantages.

Apartment Hotel Installs 192 Electric Ranges

By E. R. Jacobs
Simplex Electric Heating Company, Chicago



ONE OF THE ELECTRIC-RANGE EQUIPPED KITCHENS IN APARTMENT HOTEL

HAVING the whole building occupied and keeping the occupants fully satisfied with the conveniences in it represents two of the chief thoughts in the minds of apartment hotel owners. The owners of the recently completed Seneca apartment hotel, one of the largest in Chicago, relieved themselves largely of this problem by equipping each one of its 192 apartments with electric ranges, among many other modern conveniences, including electric refrigerators. A dining room is also operated in connection with the hotel.

All of the ranges installed are practically uniform in size, having three top burners and two oven burners, with a total rating for the range of 6,000 watts. The total connected apartment range load amounts to 1,400 kw., and the dining room kitchen load is 80 kw. The combined load, including lighting and power, amounts to more than 2,000 kw.

The Seneca is under the same management as the Barry and Cornelia apartment hotels, where gas-cooking equipment is now employed. The owners' decision to use electricity for cooking in their new building attests the merits of the electric range. Unlike most other hotel apartments, which include electricity in the monthly rent bill, this new apartment has a meter in each apartment instead of one master meter for all tenants. Current is wholesaled from the Commonwealth Edison Company and is rebilled to the tenants.

Letters from Our Readers

Allocation of Capacity Costs

To the Editor of the ELECTRICAL WORLD:

A general solution of the equations given in the articles "The Consumption and Demand Method of Allocating Capacity Cost," by W. J. Green in the ELECTRICAL WORLD for Nov. 7, 1925, and May 29, 1926, has proved of such interest that I think it worth passing on to your readers.

A consumer's capacity cost, as found by either of the methods given, can be expressed as follows:

$$c = \frac{dC}{D - PL}\,[l\,(D/P - 1) + (1 - L)],$$

in which:

d = the consumer's demand, in kva.
D = the sum of the demands of all the consumers, in kva.
P = the peak load on the power station, in kva.
l = the consumer's apparent load factor.
L = the power station's apparent load factor.
C = plant capacity cost.

(Apparent load factor is the load-factor times the power factor.)

A study of this expression discloses the facts that when a consumer's apparent load factor (l) is constant the cost will vary directly with his demand (d), the unit cost depending on the consumer's apparent load factor (l), the power station apparent load factor (L) and the diversity factor (D/P).

Of the two terms making up the unit capacity cost, one is dependent on the apparent load factor of the consumer while the other is dependent on the operating conditions of the power station only, not being affected by the consumer's load except as it influences the load factor of the power station.

When the diversity factor (D/P) of the loads supplied from the power station reaches unity (no diversity), the portion of the unit capacity cost which depends on the consumer's apparent load factor (l) becomes zero and the other term becomes (C/P), the unit peak load capacity cost. There is no question that this should be the case, for no off-peak load of a consumer will require additional capacity to take care of it, whereas every increase in peak load will require additional capacity to take care of it.

When the power station apparent load factor (L) reaches unity (which can be only when the station power factor is 100 per cent), the fixed portion of the unit capacity cost becomes zero and the portion which is dependent on the consumer's apparent load factor becomes (lC/P), the consumer's-apparent-load-factor times the unit-peak-load capacity cost. This is a reasonable result; for when a station is thus loaded each consumer is contributing, to the extent of his consumption, toward keeping the power station loaded and therefore leaving no unused capacity for other consumers.

This method of allocating capacity costs is simple and equitable. Its application requires the use of no data which, except for a complete record of the maximum demands of the consumers, are not already in the records of most electric power companies. The meters for use in obtaining the lacking information are already developed.

The method gives provable values, for consumer's apparent load factors equal (1) to unity (which can be only when the consumer's power factor is 100 per cent), (2) to the ratio of the sum of the average loads of all consumers to the sum of their demands, and (3) to zero. It accurately distributes the benefits of diversity. It differentiates between loads with different power factors. All demands of less than 100 per cent power factor are placed on a kilovolt-ampere basis. Capacity costs can be allocated accurately not only to classes of consumers, but to the individual consumers in each class. The time at which the peak load occurs has no effect on the results, since it treats diversity as a community of interests. The unit capacity costs obtained over one yearly period will not change in future years unless the station constants change. These changes will take place slowly unless there is some important change in the operating conditions of the power plant or in its capacity.

ARTHUR H. FORD
Professor of Electrical Engineering.
State University of Iowa,
Iowa City, Iowa.

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Pole Lines and Martyrs

To the Editor of the ELECTRICAL WORLD:

There is a certain spirit of martyrdom that is common to us all. We like to feel, though an admission is highly infrequent, that there is an element of injustice in our rough handling by fortune; that, after all, we are the butt of some cosmic jest; that, let us say, we are not understood by our intimates, or that fate has demanded the suppression of our more glorious inherent abilities, but that we must go on, somehow, struggling futilely against fearful odds.

Electric light and power companies have developed a group feeling of this nature. Its most violent form appears to have been discovered by Gregory M. Dexter, whose letter was published in the ELECTRICAL WORLD for Aug. 27. Of course, it is reasonable and right, and as inevitable as anything in this world, that distribution wires in residential districts be carried underground. It is as unthinkable that our irreplaceable shade trees be killed because of abraded wires, and that lovely gardens and the avenues of our fine suburban communities be rendered unsightly by raw, naked pole lines, as it is that these poles should remain on Broadway or Fifth Avenue or Michigan Boulevard. It is as ridiculous as the engineering which sets poles which have taken twenty years to grow as trees and uses them for five or ten years to carry wires. But we like, as I said before, to be martyrs. It is more expensive, initially, to install underground distribution facilities and services. It is more difficult to splice a cable than it is to have a lineman connect two open wires. I wonder if Mr. Dexter ever encountered the difficulties attendant upon an endeavor to have poles placed along the property line at the rear of fine residential streets instead of opposite the front doors.

The utility men will tell you that it is too expensive and that it is too difficult to maintain service, but they are—and I say this humbly—only feeling sorry for themselves. Utilities enjoy excellent credit. It is not fundamentally a question of cost, but a lack of appreciation of the reasonableness of a certain inevitability. Pole lines belong in the country, and beyond all doubt, Mr. Dexter will some day see them there almost exclusively. It is, after all, a phase of good public relations.

S. R. EDWARD.
New York, N. Y.

Book Reviews

Applied Magnetism

By T. F. Wall. New York: D. Van Nostrand Company. 260 pages, illustrated. Price, $8.

In this book Professor Wall has given a very complete survey of the magnetic branch of electrical engineering. An astonishing development in a knowledge of magnetism, of useful magnetic materials and of practical magnetic test methods has occurred in recent years. This book is a brief, well-written survey of all these aspects. The principles of magnetism are stated, including a good presentation of the electron theory of magnetism. Magnetic alloys and their characteristics are discussed thoroughly, and both the weak and the intense magnetic fields are treated in a logical manner. The production of magnetic fields is outlined briefly.

The outstanding feature of the book is the practical treatment of magnetic test methods and the application of magnetic testing to commercial tasks. Many new and accurate methods for testing terminations, bars, transformer cores and other materials are given. The book concludes with a brief but clear explanation of commercial applications of magnetic test methods. Flaws in metals are detected readily, and in large measure the uniformity of solid structures may be determined. The volume forms a splendid addition to the literature covering an important aspect of electrical engineering.

Fundamentals of Electrical Design

By A. D. Moore. New York: McGraw-Hill Book Company, Inc. 345 pages, illustrated.

This is a college textbook which has been tried out in design courses at the University of Michigan by Professor Moore. It treats of basic principles and methods used in the design of electrical machinery and is a refreshing and valuable departure from the "substitute-in-a-formula" type of design textbook. It is not the intention of the author to make designers of commercial machines out of college students. It is rather the intention to give students fundamental knowledge of electromagnetism, heat production and radiation, magnetic and conductive materials and methods of attack on design problems so that they will be ready to approach commercial design problems in a fundamental manner.

The scope of the book is well indicated in such chapter headings as "Fundamental Units," "Energy," "Permeability and Attraction," "Fields and Field Maps," "Magnetic Materials," "The Inductive Circuit," "Conductors and Conductor Insulation," "Coils," "Heat Radiation," "Heat Dissipation," "Thermal Properties and Thermal Calculating Methods," "Armature Windings," "Commutation," "Main-Pole and Leakage Flux," "Armature Reaction" and "Direct-Current Machine Design."

The book accents the thermal element in design and is notable for its material on heating and commutation. It restricts its field to direct-current machinery and would be more valuable if it contained some fundamental treatment of design principles where rotating alternating-current fields are present. Good illustrations and well-presented subject matter add to the attractive features of a volume which should prove very popular in college design courses.

Year Book on Commercial Arbitration in the United States, 1927

By the American Arbitration Association. New York City: Oxford University Press, American Branch. 1,152 pages.

This is the first of a series of standard publications on arbitration being prepared under the direction of the American Arbitration Association. The association is a voluntary educational organization, supported by dues and contributions, which serves business through the promotion of arbitration to eliminate the notorious delay, expense and bad after-effects of litigation. The officers include such persons as Herbert Hoover, Charles E. Hughes, L. R. Eastman (president), Charles M. Schwab and Owen D. Young.

This Year Book describes in great detail the existing machinery for the arbitration of commercial disputes. The extent and availability of these facilities will probably come as a surprise to many business men and industrialists. In the first 42 pages the association is described, with detailed instructions for conducting arbitrations under its auspices.

The body of the book is a complete outline of the existing arbitration arrangements in practically every important industry. Each industry is treated separately with details of the arbitration procedures now in use by its various societies and trade associations. Readers of the ELECTRICAL WORLD will be interested in the sections dealing with engineering societies and numerous associations of builders and contractors, with financial organizations and with heat, light and power.

This treatment by industries is followed by a description of the arbitration rules of the United States Chamber of Commerce, the International Chamber of Commerce and local chambers all over the United States.

Four "annexes" give concise summaries as follows: I—A summary (by states) of the statutes governing commercial arbitration; II—The United States arbitration act; III—How to arbitrate under the New York law; IV—Arbitration practices in 32 countries.

The great mass of material it contains is no hindrance to the convenient use of this Year Book. With the aid of name and subject indexes the busy executive can quickly locate those sections relating to arbitration as it exists today in his particular industry or field of work. He will find specific data, names and addresses of organizations, forms and rules of procedure with which he can easily chart a practical course of action. If this book leads to a more general understanding and acceptance of the economics of commercial arbitration, it will help eliminate one of the most glaring wastes in modern industry.

Domestic Electric Heating

By H. G. Solomon. London: Crosby-Lockwood & Sons. 116 pages, illustrated.

This little volume of 112 pages is described as an elementary handbook on the electric heating of residences and public buildings, domestic electric hot-water supply and domestic electric cooking. After a short introductory chapter on the phenomena of heat transfer by convection and radiation, including some exposition of the mathematical formulas involved, the author goes on to give a description of the various kinds of electrical heating devices in use in the British Isles and on the European Continent. The apparatus described is essentially the same as that with which the American public is more or less familiar. From the amount of space in the book devoted to the electric heating of buildings one concludes that this outlet for the central-station product has received more attention, at least in theory and speculation, and probably also in practice, on the other side of the ocean than it has in the United States. The author speaks of low rates for electrical energy, referring definitely to a rate of one-quarter of a penny per kilowatt-hour. This at par exchange is one-half cent, a rate not usual in the United States nor, we venture to say, very common in Europe for this class of service.

Books Received

Steam and Gas Turbines. By Dr. A. Stadola. Translated by Dr. L. C. Loewenstein. New York: McGraw-Hill Book Company, Inc. 2 vols. 1,356 pages, illustrated. Price, $15.

Electric Power Equipment. By J. G. Tarboux. New York: McGraw-Hill Book Company, Inc. 455 pages, illustrated. Price, $5.

Modern Electrical Illuminating. By Cyril Sylvester and Thomas E. Ritchie. New York: Longmans, Green & Company. 416 pages, illustrated. Price, $15.

Der Drehstrom-Induktionsregler. By Dr. F. H. Schait. Berlin: Julius Springer. 256 pages, illustrated. Price, 25.50 marks.

Rotary Converters. By E. P. Hill. New York: D. Van Nostrand Company. 329 pages, illustrated. Price, $9.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

480-Kw. Superpressure Steam Turbo-Generator.—Rapid improvements in the construction and design of high-pressure boilers have permitted the development of turbines which will utilize super-pressure steam. In this article a unit is described which has been constructed to operate with a steam pressure exceeding 1,440 lb. per square inch and at a temperature of 400 deg. C. The exhaust pressure is arranged for approximately 85 lb. per square inch, and 480 kw. is developed from 26 lb. of steam per kilowatt-hour. Details of design are indicated. — *Engineering (England)*, Ang. 5, 1927.

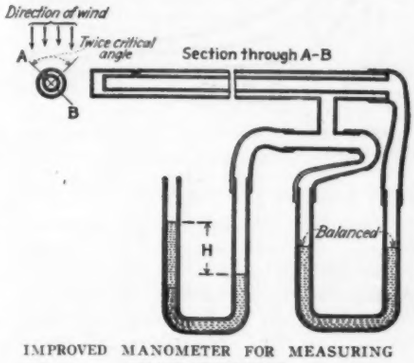
Boiler-Feed-Water Problems and Methods of Treatment. — SHEPPARD T. POWELL.—This paper constitutes a brief survey of the methods employed in the treatment of boiler feed water for the removal of suspended solids, the elimination of scale-forming salts, purification of make-up by evaporation and the removal of non-condensable gases for the prevention of corrosion. Continuous blow-down systems and electrolytic scale-prevention appliances are discussed briefly. The phenomena of priming and foaming are also touched upon. The author has endeavored to compare the various methods of achieving the desired results, and he reviews the present status of this problem. It is planned that under the auspices of six of the major engineering societies information shall be collected on the various methods of feed-water treatment and studies made upon the value of new processes, in order to correlate operation and theoretical data. The information is to be published yearly in the form of progress reports. It is thought that through the co-operative efforts of the various engineering societies definite and accurate knowledge of the subject may become possiblbe.—*Mechanical Engineering*, September, 1927.

Transmission, Substations and Distribution

Calculation of Interconnector Synchronizing Power. — S. AUSTEN STIGANT and H. MORGAN LACEY.—Methods of calculating the average synchronizing power of an interconnector line between two power stations by means of simple trigonometrical and geometrical terms. The calculations are given in detail for the cases of equal and unequal station busbar potentials, and while the general solution is that covered by the latter case, it is shown that the form of the two cases is identical. The average synchronizing power of an interconnecting line varies along that line according to the direction of the power transferred and the changes in the power factor of the total current delivered to the interconnection. That is to say, the synchronizing current, which is the power current component of the additional total current which flows through an interconnection attendant upon a change of phase angle between the station busbar voltages, may be defined with respect to the busbar pressures of either station or to the vector average of them. It is the vector average of the station busbar potentials which is considered as the vector of reference in the accompanying discussion.—*World Power (England)*, August, 1927.

Units, Measurements and Instruments

Measurement of Static Pressure.—CARL J. FECHHEIMER.—A new method for measuring static pressures in air-flow determinations has been devised. The instrument is constructed in the form of concentric brass tubes, the outer of which is ¼ in. in diameter. Installations may be easily made in air ducts through small openings. Pressure is communicated to manometers through two holes, one to the inner tube and the other to the concentric space between the tubes, about 78.5 deg. apart. The instrument is held perpendicular to the flow in such a manner that the direction of flow bisects the angle between the axes of the holes. When this position is attained, which can be determined by balancing the pressures on one manometer, the reading on a second manometer gives the static pressure. The instrument is credited with less error when used in turbulent flow than are other types. An analysis, with experimental data, of the flow of air around a cylinder is included in the discussion of this device.—*Mechanical Engineering*, August, 1927.



IMPROVED MANOMETER FOR MEASURING STATIC PRESSURE

Universal Photometer.—ANDRÉ BLONDEL. — A precision instrument of the portable type is described. The design of the photometer and the method of operation are so simple that it is readily applicable to shop use. Two new principles are used in the construction: A uniformly illuminated small white surface serves as the light standard, and the introduction of an artificial pupil makes it possible to use Lord Rayleigh's principle of light measurement. The theoretical principles involved receive full consideration. With certain auxiliary equipment, contained in a small portable case, the instrument can be used to measure the intensity of direct illumination, the effect of far away and exceedingly small light sources, spherical illumination and pyrometric observations.—*Revue Générale de l'Electricité*, July 2, 1927.

Ambient Temperature for Electric Machines.—M. KLOSS.—The operating characteristics of the insulating materials used in such electric machines as generators, motors and transformers depend largely upon the maximum temperature to which they are subjected during normal operation. Careful statistical temperature investigations, covering the temperate and semi-tropical countries the world over, indicated a value of 35 deg. C. to be generally applicable. The International Electrotechnical Commission has established an ambient of 40 deg. C. as standard. The author has endeavored to show that this 5 deg. higher temperature is neither economically nor logically warranted. — *Elektrotechnische Zeitschrift*, Aug. 4, 1927.

Illumination

Illuminating Engineering.—JOHN W. T. WALSH.—In order to secure freedom from glare and excessive contrast in the field of view, adequate diffusion, correct color and proper proportions of local and general lighting, the author foresees the necessary co-operation of experts who are acquainted with physics, engineering, physiology and psychology before the work of the illuminating engineer can be complete. It is pointed out that in regard to glare the governing factor is not the brightness of the field viewed but the brightness of the image formed on the retina of the eye, and that as the pupil of the eye enlarges at the lower values of field brightness it is unsatisfactory and unscientific to plot values of field brightness as viewed by the eye with the natural pupil. The necessity for a comparatively high value of field brightness if the maximum precision is to be obtained in photometry is a point which, the author states, is often overlooked. In illumination work it is often necessary to measure lighting effects of an order of 0.5 foot-candle or less while in street-lighting work values of less than 0.1 foot-candle are frequent. Un-

der such conditions, since it is by no means possible to increase the brightness of a surface, precision measurements cannot be obtained by ordinary photometry. There is the further disturbing factor of color difference. Photographic measurements of any kind involving a slight difference in color between two parts of the field to be compared make a judgment of brightness equality very much more difficult, and, for proper comparison, color quality must be reduced or adjusted to meet the illuminating quantity. Illuminating measurements by the use of photometry are subject to a minimum potential uncertainty error of 3½ per cent within which no brightness difference can be detected. The last few sections of this paper have been devoted to a discussion of some of the matters which have to be taken into account when planning a lighting installation. Practical considerations, particularly as regards expense, offer an influence which prevents the utilization of scientifically desirable procedures. —*Journal of the Institution of Electrical Engineers (England)*, August, 1927.

Generation, Control, Switching and Protection

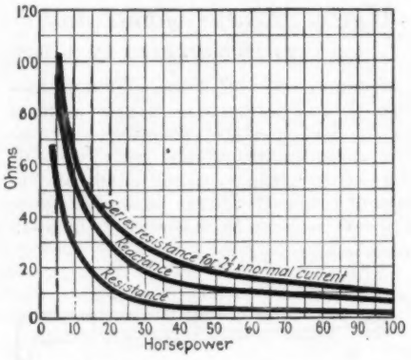
Thermostat Relay.—F. SCHMIDLIN.—Protection of electric machines against overheating may be afforded or, in automatic stations, the generators may be added to the line by means of an external hot spot. A current transformer is inserted in the controlled circuit, and its secondary feeds a heating element placed in a small oil vessel. Immersed in the oil are two thermostats, one for the low, the other for the high temperature limit. The amount of current passing through the heating element is proportional to the line current, so that the oil in the relay vessel will follow the temperature condition of the protected machine. The thermostats act upon a double-action relay, which in turn may sound an alarm, trip a switch or start a generator. — *Brown, Boveri Mitteilungen*, August, 1927.

Heat Applications and Material Handling

Electrode Steam Generators.—Because of their high efficiency and on account of the small space required for installation, electrode steam generators have enjoyed extensive use abroad. The generators may be connected directly to the high-tension supply. Voltages between 3,000 and 8,000 may be applied to boilers of a capacity of 300 kw. and higher, while for higher potentials it is possible to build steam generators in sizes of at least 5,000 kw. These generators are particularly suitable for utilizing electrical energy that is supplied at low rates during periods of light loads. Electro-generators have been used in connection with steam accumulators and for the production of process steam. Efficiencies as high as 98 per cent have been obtained with boilers of 1,200 kw. capacity operating under a potential of 6,400 volts.—*Engineer, (England)*, Aug. 12, 1927.

Motors and Control

Starting of Squirrel-Cage and Synchronous Motors.—W. WILSON.—The fundamental considerations involved in the selection of the method to be used for reducing voltage for the starting of squirrel-cage and synchronous motors and the relative advantages of these methods are considered in this article. Where series resistances are used the author gives a plan for calculating the approximate resistance necessary. The switch starters which incorporate low-voltage releases and overload cut-outs are given illustrative treatment. Voltage reduction through the use of transformers is considered. The author points out that, aside from official regulations, no special starting apparatus is required by any squirrel-cage machine, however large, as no damage will result to a well-designed motor through direct connection to the full voltage of the line. *Electrical Times (Australia)*, June 28, 1927.



AVERAGE REACTANCE AND RESISTANCE OF SQUIRREL-CAGE MOTORS AT 400 VOLTS AND 50 CYCLES

Electrophysics, Electrochemistry and Batteries

Some Experimental Methods in Magnetostriction.—S. R. WILLIAMS.—The various magnetic phenomena which occur under the general classification of magnetostriction have been investigated upon the basis that there is one and only one set of physical and chemical properties corresponding to a given set of magnetic characteristics, and that conversely there is one and only one set of magnetic properties corresponding to a given set of physical and chemical characteristics. The importance of this subject is becoming more evident in the testing of materials and their magnetic properties. In this article the author describes the mechanical strains due to magnetic stresses as represented by linear changes, circular changes and volume changes. He also considers magnetic changes due to mechanical stresses for the same classification. Certain allied phenomena which are closely related to the magnetostrictive effects but for which the relationships are not clear are mentioned. The author outlines several outstanding needs in connection with research work in magnetism and suggests that an improvement in all forms of instruments for magnetic measurements should be made, and work involving a repetition of most of the research already done, but using improved methods and materials, is suggested. The importance of correlating various magnetic phenomena by data obtained from the same specimen is highly emphasized. Co-operative, sustained research is stated to be a definite requisite.—*Journal of Optical Society of America and Review of Scientific Instruments*, May, 1927.

Telegraphy, Telephony, Radio and Signals

Carrier-Current Telephone System. — R. DUBOIS. — A modern carrier-current telephone exchange, the details of which are given in this paper, has recently been added to the extended high-voltage transmission lines of the French Basse-Isère system, operating at 120,000 volts. Specially designed coupling condensers, conected to the lines at every station, provide the link between the high-frequency telephone currents and the 50-cycle power current. A test voltage of 240 kv. is impressed on the condensers for one minute as a preliminary to installation. High-voltage fuses and a double set of overvoltage protectors, connected to the secondary side of the condensers, provide safety features for operating conditions. A frequency "translator" permits the interconnection of this system with the local exchanges in the various stations. The cost of the entire equipment is much less than that necessary to provide a separate telephone line and has, in addition, the advantages of greater reliability, independence of atmospheric interference and lower operating expense.—*Revue Générale de l'Electricité*, June 25, 1927.

Miscellaneous

Industrial Research Laboratories of the United States. — The third edition of this volume contains a list of the laboratories engaged in research work throughout the country. The staff personnel and the nature of the work undertaken by them and by the laboratory are indicated. An alphabetical list of the directors of research is included, as well as a geographical tabulation of the location of laboratories in various states. The subject classification, indicating the particular problems and subjects with which each laboratory may be considered to be particularly familiar, is of value for ready reference. —*Bulletin No. 60 of the National Research Council*, 1927.

News of the Industry

Raleigh-Roanoke Line Goes Into Service

Final Tie in Uniting Transmission Systems Which Stretch from Chicago to Mobile, Permitting Extensive Interchange of Energy

THROWING of a switch at the Carolina-Virginia state line near Danville on Monday, Sept. 5, completed the last link in an interconnection of electric generating stations producing more than 7,500,000 kw. The Raleigh-Roanoke transmission line is the final tie connecting plants, mostly hydro-electric, generating about 3,000,000 hp. in the Southern States with steam-electric power stations in the North of more than twice that capacity, thus permitting extensive interchange of energy by adjacent systems or through progressive borrowing.

The newly completed tie line directly connects the Carolina Power & Light Company's with the American Gas & Electric Company's system. Interconnections of the Carolina company to the south include the hydro-electric plants of the Southern Public Utilities Company, the Georgia Railway & Power Company, the Columbus Electric & Power Company and the Alabama Power Company. Through the American Gas & Electric Company system the Northern interconnections include the Northern Ohio Power Company, the Ohio Public Service Company, the Cleveland Electric Illuminating Company, the Toledo Edison Company, the Commonwealth Edison Company and the West Penn Power Company and its connections.

"This interconnection will be of great economic advantage to all of the communities and industries in the territory served, reaching as far south as Mobile, Ala., and as far west as Chicago," said George N. Tidd, president of the American Gas & Electric Company. "The mills of the South will be protected as never before against power shortage on account of low water. Large supplies of steam-electric power generated in the Pocahontas and adjoining coal fields and from the Northern interconnections can be used in the South when needed. On the other hand, surplus hydro-electric power generated in the South can be used in the North and aid materially in coal conservation. Reliability of service will be strengthened throughout the territory, and the smallest village on the lines of any of these companies can offer power to new and growing industries equal to that available in the greatest cities. Each of the companies in the interconnected system will of course operate, as in the past, independently. Interconnection simply means that the companies agree to furnish each other with power when needed and as conditions warrant."

The new transmission line is carried on steel towers and operates at 132,000 volts.

Cincinnati Railway to Buy All Power Used

By the terms of a contract entered into between the Union Gas & Electric Company of Cincinnati and the Cincinnati Traction Company the latter will purchase its entire supply of electrical energy from the former after the railway company shall have erected a complete new distribution system. Since 1921 the railway company has purchased about half its energy from the central station. Its new distribution system will cost about $750,000 and will involve the erection of eighteen automatic substations at strategic points throughout the city. The Union Gas & Electric Company will purchase the Pendleton generating plant of the street railway, on Eastern Avenue. The Union Gas & Electric will deliver 13,200-volt energy to every railway substation, where it will be stepped down to 440 volts and converted to 600-volt direct current.

Potomac Edison Opposes Plans for Great Falls Plant

One of the strongest opponents of the Potomac River Corporation's plans for a great hydro-electric development at Great Falls and neighboring Potomac and Shenandoah sites is the Potomac Edison Company of Maryland, which furnishes electric power to a wide expanse of territory in the Upper Shenandoah Valley of Virginia, the Panhandle counties of West Virginia, to Maryland and a group of Pennsylvania counties. This opposition, which seems to have been unexpected, was made manifest at the recent hearings.

E. L. Coblentz, chairman of the board of directors of the Potomac Edison Company, has requested of the Federal Power Commission an opportunity to show that plans of the Potomac River Corporation would be destructive of his company's interests in the territory affected. Mr. Coblentz claims the Potomac Edison's big power plant at Williamsport, Md.; the plant on the Great Cacapon River in West Virginia and the plant at Millville, W. Va., would be made useless. He said that his company is now planning further development of the Williamsport hydro plant, and if the Potomac River Corporation is allowed to come in, plans for the development of the power resources of the Shenandoah and Potomac Rivers would be seriously crippled.

N.E.M.A. Executives and Industry Sales

Three-Day Meeting at Association Island Takes Steps Toward Market Development and the Meeting of Commercial Needs

EXECUTIVES of the member companies of the National Electrical Manufacturers' Association who are organized in the Policy Division of the N.E.M.A. held a three-day meeting the end of last week at Association Island, Henderson's Harbor, N. Y. It was the second meeting as a separate division, and about 125 of the heads of companies were present. The program provided about equal opportunity for business sessions and for play and informal contact, "the Island" being selected for the meeting because of its unique facilities for the building of friendships between delegates meeting there.

The most important session was devoted to the consideration of market development and the commercial needs of electrical manufacturers. W. E. Sprackling, president of the Tubular Woven Fabric Company, challenged the industry to bestir itself in this market. The time has come, he said, when the dominance of engineering thinking must give way to the kind of commercial leadership that has built other industries, and the need is urgent if the present blight of overproduction is to be overcome by constructive progress instead of lapsing into further partial paralysis. He urged the immediate organization of an industry program of market development that would capitalize the experience of other industries that have conspicuously benefited by co-operative popular advertising and the education of the trade. He called on the association to join with the other organizations of the industry in the coming joint sales conference, recommended by the recent industry conference on wiring, to set up an industry program to bring about the rewiring of the homes of America so that complete equipment may be used.

H. T. Bussmann, president of the Bussmann Manufacturing Company, supported this recommendation in a powerful address, citing the experience of the automotive accessory and the plumbing industries in meeting the same problem by vigorous action, and painted a vivid picture of the present status of electrical contracting. With an average of 30,000 wiremen working for the industry, he said, it is at present without any organized means of educating, guiding, stimulating or controlling these workmen, excepting only the 2,300 members of the Association

of Electragists, who are at least organized and working to a purpose. It was unanimously voted to appoint a committee of "outstanding sales-minded executives" to carry forward the plan.

Considerable discussion was devoted to the elimination of the use of substandard materials, the need for the improvement of trade policies and the present relations between labor and the electrical manufacturing industry. The committee which is now studying the possible advantages of the cross-licensing of patents made a progress report recommending a thorough analysis of the economic benefits offered by cross-licensing in specific lines of products. The organization of an Appliance Division was authorized, following a mail ballot of the membership, to embrace the manufacture of domestic motor-driven and heating appliances, and approval was granted for the formation of a mica section in the Supply Division.

R. I. Russell was elected to the board of directors to succeed F. S. Hunting. Vice-President C. L. Collens, who presides over the Policy Division, recommended the reorganization of the N.E.M.A. into two major divisions—commercial and technical—to embrace all sections, instead of the present Apparatus, Supply, Appliance and Radio divisions. Mr. Collens' recommendation, which was noted at greater length last week (page 476), is under consideration.

Denver Conference Adjourns to Sept. 19

Optimists Hope for an Agreement on the Division of Water, but with Nevada Likely to Give Support to Arizona, the Fight Over Power Will Go On

FAILING to reach an agreement last week, the Denver conference over the Colorado River between the governors and other representatives of the seven states concerned adjourned until Sept. 19. Hope is expressed that when it reassembles an agreement on the division of the water will be arrived at; but there is little likelihood that any common ground upon the power features of the problem can be found, for not only does Arizona maintain an unqualified opposition to the Boulder Dam bill favored by California, but Nevada also, if correctly represented by Senator Pittman, will align herself in opposition.

To five of seven proposals put forward as a compromise plan California agreed, and to another five Arizona assented. Each state, however, rejected one and amended another. California refused to allot Arizona the water of approximately 675,000 acre-feet for her Indian lands as a vested right, and Arizona struck out a provision that "water from the tributaries reaching the main stream above Laguna Dam shall be considered part of the main stream and be divided equally between Arizona and California." Just before the adjournment California put her total demands at 4,600,000 acre-feet of water, which Arizona insisted was 400,000 acre-feet in excess of the amount to which California is entitled.

It is predicted that the water allocation will be taken up separately when the governors meet on Sept. 19 and that a speedy adjudication of this feature may be made. The power question would then be considered separately; but if the Swing-Johnson bill is construed to mean that the federal government owns the beds of streams, it will not only be rejected by Arizona and Nevada but will probably not get the sanction of a single upper state governor. When Senator Pittman addressed the meeting he took a firm states' rights stand, saying:

"There has been a lot of grandiloquent talk in this conference about the sacredness of states' rights, and I am merely giving you one simple illustration of what is meant by the term 'states' rights.' If the Boulder Dam is built on Arizona and Nevada soil, there can be no question about the rights of these two states to be first purchasers of all the power developed and their right to retail whatever portion they please at a profit.

"The last Congress was ready and willing to construct the Boulder Dam and build the all-American canal, except for one thing—a sufficient number did not believe it was fair to Arizona. They feared the setting of a precedent that would harass every state in the Union in ten years. There was not a senator that questioned the principle. All recognized the sovereignty of states over their waters. It is evident the water and power questions are indissolubly mixed. There can be no agreement as regards water without an agreement relative to the distribution of power."

London Progresses Toward Electrical Co-ordination

The electrical co-ordination scheme now in hand in England is being actively forwarded in London. The London Power Company, which was formed in 1920 as a merger of the various existing companies, now controls the generating stations and main transmission lines of ten of the London electric supply undertakings. It is actively engaged in co-ordinating the generation and transmission of electrical energy at 22,000 volts within its area of supply, with a view to meeting the requirements of its constituent companies — and any other authorized undertakers whom the company is expressly empowered by statute to supply —until the year 1971, when its franchise terminates.

The program of engineering works now being carried out by the company may be briefly summarized as follows:

(a) The extension of four existing suburban generating stations by some 220,000 kw. of plant, one being the source of supply that is furnished to the Southern Railway for its electrified lines. All these extensions will be completed by the winter of 1929-30.

(b) The laying down of a 22,000-volt transmission system interconnecting the above four generating stations, from which will be supplied the requirements of the ten constituent companies and any other authorized undertakers, whether company or local authority, whom the company may directly or indirectly supply in bulk.

Some of the older generating stations of the constituent companies will be closed down as the newer plants come into commission this fall, and bulk supplies will be furnished at the standard pressure of 22,000 volts.

In addition to the foregoing, the company has recently received from the Electricity Commissioners its authority for the erection of a generating station in south London to contain eventually 360,000 kw. of plant, the first section of which will, it is expected, be brought into service for the winter of 1931-32.

Commissions Are Defended by Oregon Chairman

"The alleged assertion of the Attorney-General of the State of Ohio to the general effect that 'both public utility commissions and legislative bodies have failed ignominiously in their efforts to protect the public' is founded neither on facts nor even on casual investigation," Louis E. Bean, chairman of the Public Service Commission of Oregon, said recently. "Supposition, based upon information of a casuistical nature, has been the source from which innumerable attacks upon the efforts of public utilities commissions to assist both the industry and the consumers have come in the past," he declared. "Just why these frequent and unearned criticisms should be directed at the members and regulatory rules of the commissions as a whole is beyond clear understanding."

Referring to alleged negligence on the part of state legislative bodies to provide for more efficient utility regulation, Mr. Bean, who himself served as senator and representative in the Oregon Assembly for a period of fourteen years, flatly denied the allegation. "There has never been a time in my experience," said the Commissioner, "when the lawmaking department of this state has refused to delegate to the Public Service Commission any authority by which the regulatory body could more adequately and properly carry out the functions necessary to the best interests of the state and its citizens. As a matter of fact and common knowledge there is not a utility commission in existence today that does not possess more regulatory authority than any other governmental department, and this power has been vested solely by the legislative assemblies."

Before the Power Board

Favorable Report on Savannah River Project — Another Application for Flathead Lake—Sixty Licenses and Twenty Permits in Fiscal Year

THE Chief of Engineers has reported to the Federal Power Commission on the application of the Savannah River Power Company for a license covering the Clarke Hill site on the Savannah River. It is proposed to develop 35,000 hp. of primary power, but 120,000 hp. will be installed. It is understood that the report recommends the issuance of the license with the ordinary conditions providing for the protection of navigation.

M. H. Wheeler of Minneapolis has notified the commission of his intention to apply for a preliminary permit for the Flathead Lake project in Montana. This is in conflict with the application made in 1920 by the Rocky Mountain Power Company. Mr. Wheeler asks that no rights be granted for a period of three months, during which he promises to perfect his permit. Action on the Rocky Mountain company's application has been delayed because of objections raised by irrigation interests.

The Seafoam Mines Corporation of Seafoam, Idaho, has applied to the commission for a preliminary permit covering a small project on Float Creek, in Custer County. The primary capacity of the project is 230 hp.

The Arizona Edison Company of Douglas, Ariz., has applied for a preliminary permit covering a project on the Gila River, in Graham and Greenlee Counties. It is proposed to erect a dam 260 ft. high and 1,700 ft. long, and it is estimated that 19,000 hp. can be made available. The application cannot be considered at this time because of the act of March 4 suspending consideration of any applications in the Colorado River basin.

To meet objections raised by the commission the city of Allegan, Mich., is revising its plans for a power development at the Manlius site on the Kalamazoo River. The original application filed by the municipality did not provide a scheme of development as satisfactory as that of a conflicting application filed by the Fargo Engineering Company. The city was advised that in order to take advantage of the priority granted municipalities by the water-power act it would have to plan a development as comprehensive as that of the other applicant.

The Federal Power Commission had outstanding 293 licenses and 176 preliminary permits at the close of the fiscal year. Of that number 60 licenses and 20 preliminary permits were issued during the fiscal year ended June 30, 1927. The projects under license proposed to develop 1,926,587 primary horsepower, but 5,863,942 hp. is to be installed. Among the projects licensed during the last fiscal year were those of the Mount Shasta Power Corporation on Pit River No. 4, 120,000 hp.; Carolina Power & Light Company on Big Pigeon River, 105,000 hp.; Utah Power & Light Company, nine constructed projects, 518,145 hp.; Pacific Gas & Electric Company, three constructed projects, 35,700 hp.

Southern Appalachian Power Conference Next Month

Development of sufficient hydro-electric power to keep pace with the industrial growth of the South, rural electrification, the proper disposal of Muscle Shoals, the embargo against further power development on the Tennessee River and further co-operation of the Southern power companies in supplying one another with power during periods of water shortage over certain areas are among the subjects that will be discussed at the Southern Appalachian Power Conference to be held in Chattanooga on Oct. 13 to 15.

This conference will be attended by heads of Southern farm organizations, railroad officials, Southern senators and congressmen, state officials, college heads, power-company executives and others interested in the development of the South. Invitations have also been sent to the governors of the various Southern states, who have been asked to appoint fifteen delegates to represent their respective states. Governor Peay of Tennessee will give an address of welcome.

Following are some of the speakers, with subjects they will discuss:

"Phases of Flood Control," John M. Parker, flood relief director of the Mississippi Valley and former Governor of Louisiana; Richard W. Edmonds, associate editor *Manufacturers' Record*, and others.

"Power Development in Relation to Navigation," Major Louis H. Watkins, district engineer U. S. A.

"State Water-Power Laws and Their Importance from the Standpoint of the Federal Water-Power Act," O. C. Merrill, secretary Federal Power Commission.

"Decentralization of Industry," H. A. Morgan, president of the University of Tennessee.

"Electrification of Rural Sections and Farms," Prof. E. A. Stewart of the University of Minnesota.

"Pernicious Interference with the Operation of the Federal Power Act." W. H. Onken, Jr., editor of the ELECTRICAL WORLD.

"Use of Power from Muscle Shoals," L. O. Crosby, president of the Mississippi State Development Board, and others.

Invited speakers include also A. G. Patterson of Alabama, P. S. Arkwright of Georgia, H. B. Flowers of Louisiana, B. C. Forbes of New York, Secretaries Hoover, Dwight, Davis, Jardine, Work and others.

Utilities and Water Power at Babson Conference

Governor Alfred E. Smith of New York, Francis E. Frothingham, of Coffin & Burr, Boston, and Frank L. Blanchard, of Henry L. Doherty & Company, New York, are scheduled to speak on "Public Utilities and Water Power" on Saturday afternoon, Sept. 17, at the fourteenth annual national business conference fostered by the Babson Statistical Organization, Babson Park, Mass.

Purchases and Mergers

No Important Transaction Reported, but the Absorption of Small Plants Continues in Various Sections of the Country

CERTIFICATES have been filed in the office of the Secretary of State of New York merging the Lewiston Power Corporation and the La Salle Electric Corporation with the Niagara Electric Service Corporation of Niagara Falls.

The Rochester Gas & Electric Corporation has filed a certificate in the office of the Secretary of State of New York indicating a merger with it of the Northern Wayne Electric Light & Power Company of Wolcott, N. Y.

Harley R. Phelps, who operates an electrical distributing system in Vienna, Oneida County, N. Y., has asked permission to dispose of it to the Niagara, Lockport & Ontario Power Company.

The Potomac Edison Company, Hagerstown, Md., has purchased the Clear Spring (Md.) Electric Light & Power Company.

The Lindsay Light & Power Company of Manawa, Wis., has been acquired by the Wisconsin Power & Light Company. The village board of Eagle River, Wis., has rejected two offers to buy its municipal plant, one from the Wisconsin Valley Electric Company and the other from the Lake Superior District Power Company. Rice Lake (Wis.) authorities are to select an engineer to decide whether to accept a proposal made by the Northern States Power Company, which now sells energy to the city at wholesale.

J. T. Coffey, for the last two years owner of the Alma (Kan.) Light & Power Company, has sold his interests to a Chicago concern headed by E. A. Schrider. The company, a new one to Kansas, is negotiating for other plants in the state, Mr. Schrider has announced.

The Public Service Company of Colorado is to take over the municipal distribution plant at Big Springs, Neb., now served from the Julesburg (Col.) municipal plant. This will be the first Nebraska community served by the Public Service Company.

The Commonwealth Utilities Corporation has for a consideration of $25,000 purchased the electric light plant of Simla, Col., from the Town Board. The plant will be enlarged and distribution lines built to Calhan and Genoa.

It is reported that the Atlantic Public Utilities, Inc., has concluded negotiations for the purchase of the Indiana Light & Power Company and its subsidiaries, the Shepfer Electrical Company, the Brookline Electric Light & Power Company and the General Utilities Company. These properties extend over territory in Ohio west from Bowling Green and into Indiana.

The Western Public Service Company has sold its plant at Gering, Neb., to the city, which has contracted to buy energy from the government's ir-

rigation project just completed in the North Platte Valley. The contract of sale includes the retention of transmission-line connection for use if water-power service is interrupted.

The Puget Sound Power & Light Company has purchased the municipal light and power plant at Skykomish, Wash., and will add this town to its interconnected system.

Sale of the Morton (Wash.) Electric Company's plant, owned by J. B. Campbell, to O. E. Anderson is announced. The city has signed an option for purchase of the plant from Anderson.

Government Energy Dear

Farm Engineer and University Agricultural Department Head Doubts Economy of Service from Government's Plant at Minidoka, Idaho

USE of electric power generated by the government at its irrigation power station at Minidoka, Idaho, has not benefited the consumers in the surrounding territory as anticipated before the erection of the plant, according to a survey recently completed by Prof. M. R. Lewis, head of the department of agricultural engineering at the University of Idaho. The farmers expected to pay a lower price for the power generated at the government plant than they would ordinarily pay for power generated by privately owned public utility companies. The survey conducted by Professor Lewis led him to the following conclusion:

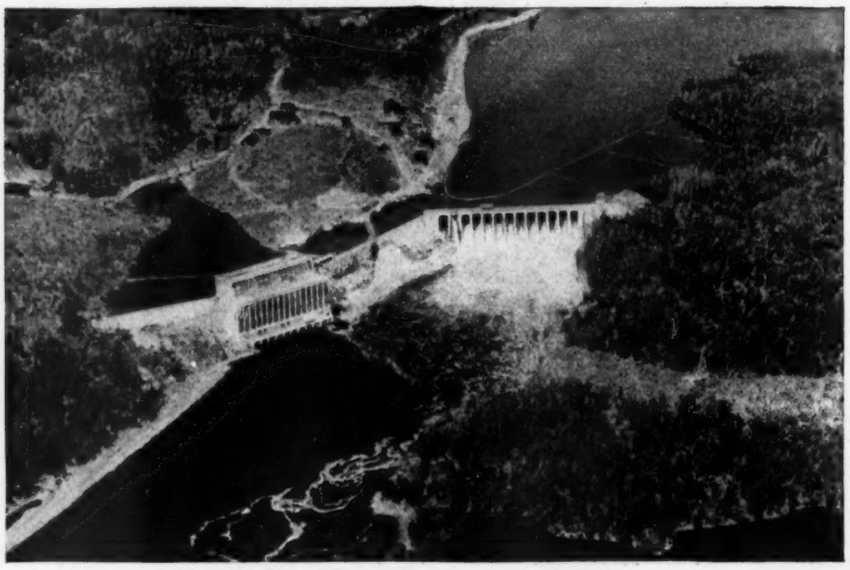
"When some enthusiast for public ownership of electric power plants claims that the government is selling power to the farmers at 2 cents per kilowatt-hour on the Minidoka project in Idaho, his attention should be called to the additional cost of operation, depreciation of lines, depreciation of transformers, meters, etc., and interest on the distribution investment which the farmer has to pay before he can use the 2-cent power. When these charges are paid the power which the farmer uses on this particular project costs him 15 cents per kilowatt-hour delivered.

"This makes the cost of such power generally higher than that furnished by the large private companies. But it would be as unfair to make a sweeping statement to that effect, without analyzing the facts in the case, as it is to make a misleading statement that the farmer can get power from the government at 2 cents per kilowatt-hour.

"Three of the largest co-operative companies, which have been in the business about seven years and which serve an average of one hundred customers, were studied, and it was found that the average cost of electricity per kilowatt-hour to the customers of those companies for a twelve months' period was as follows: Operation and maintenance, $0.0264; depreciation of distribution lines, $0.0278; depreciation of transformers, meters and services, $0.0135; interest on the distribution investment, $0.0439; cost of wholesale power plus loss, $0.0384. This results in a total cost to the consumer of 15 cents per kilowatt-hour.

"In considering the foregoing high rate it is only fair to state that the use of electrical energy on the systems considered is very low, averaging less than 30 kw.-hr. per customer per month. If the use per customer could be increased, the rate, if it followed the trend of larger power company rates, would go down as the total monthly bill of each consumer increased. But under the most favorable conditions and the largest use per farm consumer, the fact still remains that publicly owned or co-operative plants have a limited territory in which to operate and do not have the diversification of rural, industrial and city business which makes it possible to develop large central stations and give the lowest average rate to all concerned."

Bryson Plant One of Many Ottawa River Projects



ABOVE is a recent photograph of the new power development of the Ottawa River Power Company on the Ottawa River at Bryson, Quebec, about 30 miles northwest of the city of Ottawa. This plant, which was completed in 1926, has an initial development of 25,700 hp., the ultimate designed capacity being 75,000 hp. The energy generated is transmitted chiefly to the Ottawa-Hull district and sold for general power purposes. There is no district in Canada more favorably situated in regard to a dependable supply of low-cost power. Within a radius of 50 miles of Ottawa more than 300,000 hp. is already installed, while construction in progress will increase this figure to more than 725,000 hp. in the near future. If the radius is extended to 100 miles, it is estimated that undeveloped power to the extent of 3,500,000 hp. exists.

Chamber of Commerce Tells of Coal Production

A survey of conditions in the unionized bituminous coal fields, the results of which are published in a bulletin issued by the Department of Natural Resources of the Chamber of Commerce of the United States, discloses the fact that the miners' strike is dragging on toward the establishment of a record for length with little disturbance to industry as a whole. "The present coal strike in the bituminous unionized fields," the department finds, "has been running nearly five months and is likely to be the longest in the nation's series of coal strikes in both the hard and soft coal fields. It has thus far differed from other strikes mainly in the respect that there has been virtually no derangement to industry, in the lack of alarm and in the lesser degree of violence."

In central Pennsylvania, where work ceased under a temporary agreement in July, operators are reported to be preparing to start again on an open-shop basis; in western Pennsylvania a number of mines have started on the open-shop basis; in West Virginia, most of which is non-union, production has gradually increased since the expiration of the Jacksonville agreement; in eastern Kentucky and in Virginia non-union fields have also increased their production; in western Kentucky, which became non-union several years ago, production has been doubled; in Illinois, a strong union district, operations have virtually ceased; in Indiana, also a strong union district, some operators have signed up with the union and a few are working on the open-shop basis, production being two-thirds of normal, and in Ohio, also a union district, a few operators are working on an open-shop basis and production is about 30 per cent of normal. Other coal-producing districts in the South, the Middle West and the West show in the aggregate little change and are continuing their usual production of one and a third million tons weekly. Consumers' stocks, the bulletin estimates, on July 1 amounted to 62,000,000 tons, or 54 days' supply.

Excellent One-Day Meeting at Madison

Rural Service Prominent in Proceedings of Electric Section of Wisconsin Utilities Association—President Frank of University Makes Notable Speech

COMMITTEE reports that were pronounced veritable textbooks on the major aspects of rural electrification were an outstanding feature of the annual convention of the Electric Section of the Wisconsin Utilities Association, held in Madison Sept. 2 and 3. Addresses by Glenn Frank, president of Wisconsin University, and C. E. Broughton, editor of the Sheboygan *Press,* also drew much favorable notice. Delegates declared that no more compact program covering a variety of subjects had ever been presented at a one-day meeting—for Saturday was given over to inspection trips. Fifteen papers and addresses were presented on Friday, beginning at 9.30 a.m. and ending at 5 p.m.

Dr. Frank's speech was a notable utterance, the first in which the well-known publicist who formerly edited the *Century Magazine* and now heads Wisconsin's greatest educational institution had demonstrated his grasp of the part that electricity must take in national development. Approximately two hundred representatives of central-station companies and manufacturers attended the meeting.

G. G. Post, chairman of the electrical distribution committee, submitted one of the most comprehensive plans so far devised in the United States for the systematic and economical construction of rural lines. It analyzed the methods of present-day construction and set forth a general proposal based on extensive studies and designed to pave the way for the future electrification of the great majority of farms at minimum first cost.

Among the conclusions of the committee were that substations should be from 8 to 12 miles apart, the distance being affected by the location of small cities which also must be served, and that main feeders can generally be of No. 2 A.W.G. copper and branch lines of No. 2. A.C.S.R Mr. Post alluded to the wide diversity of opinion among operators as to the best system for rural distribution—4,800, 6,600, 13,200 and even 33,000 volts each having advocates. He drew some conclusions as to the most economical system which were combated by Prof. Alvin Meyers of the University of Wisconsin and G. C. Neff, chairman of the rural service committee of the N.E.L.A., in the discussion following the presentation of Mr. Post's paper, and it was agreed that the figures should be rechecked before circulation of that paper.

Grant Ford, chairman of the substation committee, presented three wiring diagrams for rural substations, ranging from the simpler to the more complete layouts, to meet the requirements of rural-district and small-town loads of 1,500 kva. and less. The committee presented the program as a step forward toward general standardization.

G. V. Rork, Owen, chairman of the rural-service committee, reported that at the end of June this year 13,749 farms in Wisconsin were receiving service from utility companies, an increase of 38 per cent over last year.

C. E. Broughton, editor of the Sheboygan *Press,* said that state regulation had eliminated the expensive fighting that used to be waged between cities and utilities. There is such a thing as too much regulation, the speaker said, but no movement can be strengthened by screening it from the public. Utility managements are a part of a community, and they should throw themselves on the side of those community undertakings which strengthen a municipality.

Chairman R. G. Walter urged continuous support of the tree-trimming school for utility linemen which was started at the University of Wisconsin last year. L. J. Beckwith, Milwaukee, chairman of the radio co-ordination committee, recommended procuring the aid of the University of Wisconsin in carrying on research work in the use of radio to locate trouble. L. P. Fessenden, chairman of the prime movers committee, predicted that the unit-type coal pulverizer, on account of its low cost for installation and maintenance as compared with other systems, will come into general use in the larger steam generating stations. The utilities should co-operate with manufacturers, he said, in perfecting the design. George H. Wilmarth, division manager Northern States Power Company of Wisconsin, after giving many specific instances of the great public and company benefits that were being wrought by interconnection, urged continued team work among companies in its further development.

C. J. Virgin, Green Bay, presented figures on the actual operating costs of oil engines. He said the Wisconsin Public Service Corporation had made a survey which showed that the average cost per kilowatt of installed capacity, covering 51 plants, was $182, inclusive of building, auxiliaries and electrical equipment. Maintenance costs in 63 plants were 3.3 mills per kilowatt-hour.

Daniel W. Mead, engineer, of Madison, in describing the Mississippi flood conditions, said that the use of reservoirs for flood protection and their use for water-power storage are antagonistic and can seldom be combined. Flood protection work should never be sacrificed to water power and for this reason water-power developments cannot be expected to bear any of the expense of installing or maintaining flood-control installations. C. H. Pfeiffer, Green Bay, urged companies to enforce reports on minor accidents, because they are all potential major accidents and because they show whether or not employees are co-operating actively and first aid is being rendered.

E. J. Kallevang, chairman of the power-factor committee, outlined the various methods used in correcting power factor in industrial plants, laying special stress on means that do not greatly add to the investment in power equipment. The need of proper-size transformers was emphasized. Too many companies, he said, are neglecting to improve the power factor of their customers' load and that of their own distribution systems. R. R. Benedict reported on the behavior of dielectric or insulating materials, a study which he conducted as a fellowship student at Wisconsin University.

Glenn Frank's Address

Dr. Frank, speaking at the banquet, proclaimed the interconnection of electric systems to be the forerunner of a new industrial movement which is beginnng to correct the sins of modern machine civilization, and he asserted that interconnection also holds out the prospect of putting agriculture on a sound economic basis without the succor of government. He declared that the masses of the people have more to hope for from technical advance and from far-sighted captains of industry than from the social reformers "who woo them with their panaceas and utopian reforms." Dr. Frank said that the leaders of modern machine civilization are writing a new magna charta, which he called the conquest of drudgery, not for altruistic purposes, but motivated solely by the dictates of sound modern business practice. The sins of the pioneering age are being recognized as bad business, he explained.

Interconnection, or, as he termed it, superpower, is already checking centralization of industry, with its attendant disease of congestion, went on the speaker, whose studies have convinced him that decentralization has already set in to correct one of the greatest evils of machine civilization. The possible correlation of agriculture and industrial production, he said, opens up a world of fascinating possibilities.

Grant Ford of the Wisconsin Valley Electric Company, Wausau, was elected chairman of the section, succeeding R. G. Walter. A. R. Frahm of the Northern States Power Company, Eau Claire, was elected vice-chairman.

Oregon Forms a State-Wide Electragists' Organization

To effect a state-wide association of electrical contractor-dealers, a group from different parts of Oregon, headed by the local electragist organization in Portland, met in that city recently and set up the "Oregon Electragists." A constitution and by-laws were adopted, permanent officers and executive committeemen were elected, and resolutions outlining trade policies and indorsing the so-called Milwaukee plan for governing jobber-contractor-relations were passed. C. A. Vibbert, Salem, was elected president of the new association.

Empire State Association's Coming Meetings

Next Thursday and Friday, Sept. 15 and 16, the Electric Meter Section of the Empire State Gas and Electric Association will hold its annual meeting at Syracuse, N. Y. Those expected to contribute papers or addresses include L. K. Brown, Depew & Lancaster Light, Power & Conduit Company, who will talk on rural metering; Prof. Charles W. Henderson of Syracuse University; D. P. Burleigh, General Electric Company; E. E. Hill, New York Edison Company; E. A. Le Fever, Buffalo General Electric Company; A. J. Allen, United Electric Light & Power Company, and M. A. Zeek, Westinghouse Electric & Manufacturing Company.

For the annual convention of the association, to be held at Lake Placid, N. Y., on Oct. 6 and 7, four addresses are announced, in addition to the customary routine and reports. These addresses will be: "Public Utility Financing," Walter J. Fitzpatrick, chief accounting division, Public Service Commission; "Utilization of Water Resources," Paul S. Clapp, managing director National Electric Light Association; "An Experiment in Industry Co-operation," Samuel Ferguson, president Hartford (Conn.) Electric Light Company, and "The Utility and the Public," George B. Cortelyou, president Consolidated Gas Company of New York.

Prospect No. 2 Plant

New Hydro-Electric Development of California-Oregon Company to Be Ready for Operation About End of Present Year

THE Byllesby Engineering & Management Corporation reports rapid progress on the Prospect No. 2 hydro-electric plant, now being built under its supervision for the California-Oregon Power Company. The diversion dam, which is about 50 ft. high and 400 ft. over all, containing three 34-ft. x 12½-ft. radial gates, is approximately 45 per cent complete, and 70 per cent of the 7,000-ft. canal leading to the forebay has been concreted. The excavation of the forebay, together with its retaining walls and outlet structure, is about 30 per cent complete.

From the forebay, wooden-stave pipe lines, one for each unit, 7 ft. 3 in. in diameter and 3,100 ft. in length, will lead to the surge tank. This tank will rise approximately 130 ft. above its base and will be immediately adjacent to the highway leading from Medford, Ore., to Crater Lake, where it will be a source of interest for tourists. From the surge tanks penstocks approximately 900 ft. in length, one for each unit, will connect with the power house. The excavation for the penstocks is now about three-quarters complete. Penstocks will be of steel and will vary from 7 ft. 3 in. in diameter at the top to 6 ft. at the bottom. The substructure for the power house is now completed up to the line of the scroll cases, and the scroll case for the first unit has been set.

Power-house equipment for the present will consist of two 20,000-kva. General Electric generators direct-connected to 22,000-hp. vertical Pelton-Francis turbines. The total effective head on this plant is 587 ft. An outdoor substation is being constructed close to the surge tank and foundation construction is now in progress.

A 132-kv. transmission line will be constructed from Prospect, Ore., to Copco, Cal., a distance of approximately 70 miles, tying in with the company's present transmission system. There will also be constructed a single-pole tap line 6 miles in length connecting Medford with this new line. Half of the poles have already been raised. At the present time there are 850 men employed by the California-Oregon Power Company at Prospect for the construction of the hydro-electric development, and about 150 men are engaged in the construction of the transmission line. The company now aims to put the first unit in operation prior to Jan. 1, 1928, and the second unit soon afterward.

Briefer News

ODESSA (TEX.) POWER PLANT BEING PUSHED TO COMPLETION.—Construction of a 3,750-kw. generating plant at Odessa, Tex., is making rapid progress. The cost will be approximately $2,000,000. Transmission lines of wooden-pole type will be built to the oil fields of Pecos, Crane, Upton and Winkler Counties. The company has obtained a 50-year franchise for supplying Odessa with light and power.

IOWA-NEBRASKA COMPANY TO HELP RURAL DEVELOPMENT. — The Iowa-Nebraska Light & Power Company will include in its 1928 budget $100,000 for the development of rural lines, part of it to be spent in connection with the state agricultural colleges of the two states in experimental work, using model farms for the purpose of demonstrating the advantages of electrical energy to the farmer. The company will pay $250 of the cost of a farm installation, the farmer user to share the excess above that figure.

QUINZE PLANT NEAR QUEBEC MINES WILL BE DOUBLED.—Work has begun on the addition to the Quinze power plant of the Canadian Northern Power Corporation in the Rouyn mining district of Quebec. It will double the capacity of the plant. At present the site develops 20,000 hp. from two 10,000-hp. units, and two more 10,000-hp. generators are being added. The work will be completed by next spring, and the machinery and electrical equipment will be taken to the plant over the ice this coming winter.

MISSISSIPPI POWER & LIGHT STARTS 110-KV. SUBSTATION NEAR CLARKSDALE, MISS.—The Mississippi Power & Light Company has completed a substation a few miles south of Clarksdale, Miss., and 110,000-volt energy will be transmitted thence to Marks, Lambert, Jonestown, Friar Point, Dublin, Mattson and Tutwiler. A line will be built at once to Glendora.

WESTERN OKLAHOMA UTILITY MEN TO MEET AT CLINTON, SEPT. 13.—The annual conference for the western district of Oklahoma held by the electric light and power division of the Oklahoma Utilities Association is scheduled for Clinton, Sept. 13, with a good program. F. D. Shaffer of Lawton is chairman of the western district and Clark Carruth of Hollis is district secretary.

RIGHTS-OF-WAY FOR CONOWINGO LINES OBTAINED. — The Pennsylvania Public Service Commission announces that agreements have been reached between the Plymouth Power Company and other Philadelphia Electric Company subsidiaries in virtually all the contests regarding rights-of-way in Montgomery and Chester Counties. This probably insures the early construction of transmission lines from the Conowingo development to territory in the Philadelphia district.

FORTY-FIFTH ANNIVERSARY OF PEARL STREET STATION.—Last Sunday, Sept. 4, was the anniversary of the day 45 years ago when Edison threw the switch which opened the electric power house at 267 Pearl Street, New York City, the first central station. On the day preceding this anniversary the tablet erected several years ago to mark the site was decorated with a wreath, which was put in place by Vice-President John W. Lieb of the New York Edison Company, one of the pioneer engineers who operated the historic station.

OSKALOOSA, IOWA, BECOMES A SWITCHING STATION. — Oskaloosa, Iowa, is now the switching center for southern Iowa's power lines, the Des Moines Electric Light Company's new switching station having been cut into the network of lines radiating from there. Oskaloosa is a terminal for the steel-tower line from the Iowa Power & Light Company's plant at Des Moines, and through the local station circuits are fed to Grinnell, Sigourney, Washington and Ottumwa. Additional circuits are operated to Eddyville, New Sharon and Montezuma.

HYDRO PLANT PLANNED FOR CATTARAUGUS CREEK, NEW YORK.—Development of hydro-electric power on a large scale by construction of a dam across the Cattaraugus Creek, between Springville and Gowanda, near Salamanca, N. Y., has become a definite future prospect as a result of the taking up of options on hundreds of acres of farm lands in that area within the past few

days. Cattaraugus Creek flows through a gorge 300 ft. deep in what is known as the Zoar region. Interests said to be allied with the Niagara Falls Power Company plan to build a dam 150 ft. high in the gorge, thus creating a lake 7 or 8 miles long. The lake would have an irregular shore line, with its maximum width perhaps a mile and a half.

NEW HAMPSHIRE'S RIGHTS IN CONNECTICUT RIVER.—The Bellows Falls Canal Company has agreed to the ruling of the New Hampshire Public Service Commission that if authority be given the company to raise the dam at North Walpole in the Connecticut River, the State of New Hampshire shall have the prior claim to all electrical energy generated from water passing over the dam. This further strengthens the claim of New Hampshire to control water in the Connecticut River on the boundary of Vermont.

SIX LINEMEN LOSE LIVES BY HIGH-TENSION SHORT CIRCUIT.—An electrical fatality very unusual because of the number of its victims occurred on Sept. 1 near Timblin, Pa., when six linemen employed by the Penn Public Service Corporation of Johnstown lost their lives, five through the contact of a telephone line they were stringing with a high-tension transmission line and the sixth —Raymond Smith—in an effort to save his fellow workmen. Two other men were injured, but were able to summon doctors and first-aid crews, whose efforts were unhappily in vain. The accident took place in a sparsely settled district. All the men belonged to Punxsutawney, Pa.

DECISION IN WESTERN MARYLAND CASE RESERVED.—Argument of the questions of law involved in the refusal of the Maryland Public Service Commission to grant the Electric Public Utilities Company authority to acquire the stock of four electric companies in western Maryland was concluded on Sept. 2 and decision reserved. The companies whose stocks were sought are the Home Electric Company of Lonaconing, Emmitsburg Electric Company, Antietam Electric Light & Power Company and the Midland Electric Company. The decision of the commission, attorneys for the complainant contended, was unlawful and unreasonable, and the argument was mainly for and against this contention.

SAN FRANCISCO CONSIDERS IMPROVING ITS LIGHTING SYSTEM.—That thousands of dollars can be saved annually in San Francisco's lighting bill by changing the candlepower of lamps in certain sections, by the use of electric lamps instead of the old-fashioned gas lamps, and by utilization of Hetch Hetchy power directly, is the contention of J. T. Whittlesey, lighting expert, to the lighting committee of the city's Board of Supervisors. His recommendations are now under consideration by the city authorities. The gradual acquisition of a municipally owned street lighting system is essential, Mr. Whittlesey maintains. He declares that under a possible arrangement with the Pacific Gas & Electric Company lighting fixtures, poles and other units may be acquired by the city and the company retain its distribution service.

ONTARIO HYDRO DISPUTES WATER-POWER LEASE WITH MUNICIPALITY.—Water-power leases on the Trent Canal, worth at least $100,000 to the Hydro-Electric Power Commission of Ontario, are involved in negotiations between the commission, the town of Trenton, two Canadian banks and the Dominion government, which controls all leases of water powers on navigable waters. At Dam No. 1 on the canal, which is within the town limits of Trenton, something like 1,700 hp. is available. The town, said not to be especially pleased over the treatment it has received from the commission, wants a lease for the development of this water power, and so does the commission. The banks, which took over the assets of private power companies, claim certain rights. It is stated that these banks have been offered $100,000 by the Hydro for their interest, if they can obtain the necessary leases from the Dominion government.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see the ELECTRICAL WORLD for July 2, page 50.]

New England Division, N.E.L.A.—New London, Conn., Sept. 12-15. Miss O. A. Bursiel, 20 Providence St., Boston.

Pennsylvania State Association of Electrical Contractors and Dealers—Lawrence Hotel, Erie, Pa., Sept. 12-14. M. G. Sellers, 1202 Locust St., Philadelphia.

American Institute of Electrical Engineers—Pacific Coast convention, Del Monte, Cal., Sept. 13-16. F. L. Hutchinson, 36 West 39th St., New York.

Empire State Gas and Electric Association—Electric Meter Section, Hotel Syracuse, Syracuse, Sept. 15-16; annual convention, Lake Placid Club, Lake Placid, N. Y., Oct. 6 and 7. C. H. B. Chapin, Grand Central Terminal, New York.

American Welding Society — Book-Cadillac Hotel, Detroit, Sept. 19-23. M. M. Kelly, 29 West 39th Street, New York.

New England Central Station Association of Power Engineers—Chamber of Commerce, Boston, Sept. 21. T. D. Bond, 200 Devonshire St., Boston.

Great Lakes Division, N.E.L.A. — French Lick Springs, Ind., Sept. 22-24. R. V. Prather, 205 Illinois Mine Workers' Bldg., Springfield, Ill.

Association of Edison Illuminating Companies—Colorado Springs, Col., Sept. 26-30. P. S. Millar, 80th St. and East End Ave., New York.

International Association of Electrical Inspectors, Western Section—Toronto, Canada, Sept. 27-29. W. S. Boyd, 175 W. Jackson Blvd., Chicago.

American Electric Railway Association—Cleveland, Oct. 3-7. J. W. Welsh, 292 Madison Ave., New York.

Illuminating Engineering Society — Edgewater Beach Hotel, Chicago, Oct. 11-14. L. H. Graves, 29 West 39th St., New York City.

Eastern Association of Electrical Inspectors — Springfield, Mass., Oct. 12-13. E. P. Slack, 85 John St., New York.

Southern Appalachian Power Conference—Chattanooga, Tenn., Oct. 14-16.

Rocky Mountain Division, N.E.L.A.—Broadmoor Hotel, Colorado Springs, Col., Oct. 17-20. O. A. Weller, 900 15th St., Denver.

National Association of Railroad and Utilities Commissioners — Dallas, Tex., Oct. 18-21. James B. Walker, 270 Madison Ave., New York.

Public Utilities Association of West Virginia—Parkersburg, W. Va., Oct. 26-27. A. Bliss McCrum, 514 Charleston National Bank Bldg., Charleston, W. Va.

COMPLETING THE ENLARGEMENT OF LOWER FALLS STATION AT ROCHESTER.—A crew of one hundred men working in eight-hour shifts Saturday, Sunday and Labor Day, Sept. 3, 4 and 5, connected the new power unit of the Rochester Gas & Electric Corporation at Station No. 5, at the Driving Park Avenue Falls, with the constructed tunnel, thus completing a three-million-dollar program started ten years ago. When the station starts up in December hydraulic power from the Genesee River at that point will be used to the theoretical capacity of its ultimate development, according to Thomas H. Yawger, superintendent of the electrical department. Station No. 5 will have a capacity of 60,000 hp., the former power falls rating being 32,000 hp. and that of the new unit 28,000 hp.

AMERICAN WELDING SOCIETY'S FALL MEETING.—Airplane, automobile and car welding will be the subject of papers at the fall convention of the American Welding Society, scheduled for Detroit Sept. 19 to 22 inclusive. G. R. Brophy of the General Electric research laboratory will give a paper on a metallurgical study of welds made by him; Joseph Matte, Jr., will discuss welding of structural steel, L. J. Sforzini welding in the design of steel-plate work, H. J. Grow the production welding of water heaters, and the San Francisco Section will report concerning its investigations into welds subjected to high temperatures. There will be a welding exhibit covering 10,000 square feet.

SENATOR WOULD EXTEND JURISDICTION OF RADIO COMMISSION.—Extension of the authority of the Federal Radio Commission so that it may have jurisdiction over telephonic and telegraphic communication is being urged by Senator Watson of Indiana, the chairman of the interstate commerce committee of the Senate. Senator Watson thinks that the commission has done splendid work thus far in straightening out the tangled radio situation, and he is strongly of the opinion that it should be made a continuing body. He expects to propose amendments to the radio act striking out the provision for the transfer of authority to the Secretary of Commerce at the end of a year and extending the law to include the telegraph and the telephone

KANSAS FARMERS TO SEE RURAL ELECTRIFICATION EXHIBIT.—Complete in every detail and occupying 1,000 sq.ft. of space, a rural electrification exhibit on an elaborate scale will be one of the attractions at the two Kansas state fairs, held at Topeka and Hutchinson during the middle of Sep-

tember. Built by the engineering extension department of the Iowa State College, the exhibit is now appearing at the Iowa and Nebraska state fairs. Made exactly to scale, the miniature farmstead comprises all the buildings, livestock, cribs, pens, silos, machine sheds and the like to be found on the best modern farm. All of the buildings are wired, lighted in approved fashion, and the diminutive machinery is set in operation. Several hundred thousand Kansans will view the exhibit at the Topeka fair alone, it is estimated by A. M. Patten, vice-president of the Kansas Power & Light Company and for a number of years president of the Kansas Free Fair Association.

LINEMEN CONVEYED BY SEAPLANE ESCAPE ROUGH WALK.—R. P. McHaffie of the Manitoba Power Company reports a new method of getting crews quickly home after trips into rough back-country territory. A Fokker seaplane, he says, which conducts a regular flying service from Lac du Bonnet to Long Lake, in the central Manitoba mining area, was used to bring back a party of linemen who had completed a final inspection of the new 43-mile, 66,000-volt transmission line of the Manitoba Power Company from Great Falls. Rather than risk the hazards of the 40-minute flight, a few of the party elected to walk, the nature of the country being shown by the fact that they did not arrive at their destination until three days later. This section of Manitoba is virtually inaccessible during the summer except by motor launch and canoe. All heavy freighting has to be done in the winter over snow roads. With the introduction of electric power rapid development of the area is looked for.

WATER RESOURCES OF COLUMBIA RIVER BASIN. — The surface water supply of the Lower Columbia River basin and the Pacific Coast drainage basins in Oregon is the subject of a report just issued by the Geological Survey of the Department of the Interior. This is one of a series of fourteen annual water-supply reports that show the results of government stream measurements covering the different drainage basins of the United States. The stream measurements in Oregon and Washington were conducted by the Geological Survey in co-operation with these states, and during the year ended Sept. 30, 1923, 102 stream-gaging stations were maintained on the Columbia, its tributaries below the Snake River and rivers in Oregon that empty directly into the Pacific. The Columbia drains a basin 259,000 square miles, which covers portions of seven states and of Canada. Its flow during the year covered by this report ranged from a low-water discharge of 56,000 cu.ft. a second in December to a high-water discharge of 581,000 cu.ft. a second during the summer flood in June. This river system, the report says, contains at least one-third of the water power available in the entire United States.

Commission Rulings

BETTER RETURNS PREDICATED ON LOWER RATE.—In fixing a tariff for the Polk-Barnett Light & Power Company of Cushing, Wis., the Railroad Commission of that state determined on a 6 per cent rather than a 7 or 8 per cent rate of return because it thought that a higher percentage would make the price of energy so high as to necessitate the employment of rates prohibitive to a large number of would-be consumers. The company has long transmission lines and low density of customers.

CHANGE IN RATE OF AUTHORIZED SECURITY ISSUES WOULD BE UNFAIR. —The Indiana Public Service Commission has denied petitions of the Northern Indiana Power Company, the Attica Electric Company, the Indiana Electric Corporation and the Wabash Valley Electric Company for rehearings to obtain a reduction in the minimum rate at which securities already authorized may be sold. These utilities make up what formerly was known as the Brewer group, now controlled by the Insull interests. More than $2,000,000 in securities was concerned, and the commission said it would not be fair to the companies or to the public to grant the request.

DETERMINING A MINIMUM POWER CHARGE.—A minimum charge for power service has been included by the Wisconsin Railroad Commission in the rate schedule of the Princeton municipal electric plant, the commission stating that this charge should vary with the size of the installation, as the minimum should bear a more or less close relation to that part of the expense which depends on the demand as well as to those expenses which are commonly called consumer expenses. It was held that by adding the direct consumer expenses to the fixed charges on the meter investment and also making a sufficient allowance for the demand element and the energy which would be consumed under the minimum bill, the minimum charge might be definitely determined.

FREE SERVICE EMBODIED IN A FRANCHISE IS UPHELD.—Enactment of the public utilities act did not abrogate contracts between utilities and municipalities, it was held by the Public Utilities Commission of Utah in an order handed down in connection with a complaint made by the town of Joseph that the Telluride Power Company was, under the terms of a franchise ordinance, unlawfully refusing to furnish the town with free electricity for street-lighting purposes. The order requires the Telluride Power Company to restore service to the town as provided under a contract which the predecessor of the Telluride Power Company entered into with the city in 1913, at the time a franchise was granted. Under the terms of this franchise the municipality was to receive free of charge certain lighting service, and this the Telluride company refused. The commission held that ordinarily free service to any consumer would be discrimination. In the case at issue, however, the commission held that the franchise was based on a contract between the town and the power company. Such contracts are subject to the police powers of the state and can be regulated or abrogated by the commission, but they should not be set aside in the absence of a proper showing that they are unduly preferential, unreasonably discriminatory or unjust between the utility and other patrons, the commission declared. Until such showing is made the power company is required to give the service called for, and it must also credit the city with the revenue received for street lighting from the time the company refused to grant free service.

Recent Court Decisions

DUTY OF COMPANY ERECTING TRANSMISSION LINE TO KEEP POST HOLES COVERED.—A verdict of damages in McKee vs. Iowa Railway & Light Company was sustained, though with a reduction in the sum assessed, by the Supreme Court of Iowa. The injury was caused by a fall into a post hole alleged to have been left uncovered, though this the company denied, asserting that its covering must have been removed by a third party and alleging contributory negligence. (214 N. W. 564.)*

RIGHT OF EMINENT DOMAIN AS APPLIED TO WATER-POWER DEVELOPMENT.—Sustaining the constitutionality of what is known as the Miller water-power law of New York State in People ex rel. Horton vs. Prendergast and declaring valid an action of the Public Service Commission taken in accordance therewith, the New York Supreme Court said: "The theory upon which this right of eminent domain is exercised is that the rights of the individual must yield to considerations of public good and the common welfare. The property of all individuals or corporations is held subject to the right of the state, in the exercise of the power of eminent domain, to appropriate it for public use. The right may be exercised directly by the Legislature, or through corporate bodies or individuals to whom the Legislature has delegated the power. The production of electrical energy for light, heat and power for the use of the public generally is a public use. The exercise of this power

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

is due process of law, if the established conditions of its exercise are observed. That the right of eminent domain is allowed to be exercised by a corporation which has clearly a major part of the head and useful flow of a stream, as against a minor holder, is not such a discrimination as deprives the minor holder of equal protection of the law. The Legislature may delegate the power to condemn to a municipality, a private corporation, a transportation corporation or an individual, if only the use to which the property when condemned is to be put is a public use. The right here conferred could have been conferred upon strangers, as in the case generally where the right has been conferred. Here there is a limitation; only a corporation which owns the major part of the power of the stream can condemn. There is here no unequal protection of the law; the rights of the relators yield, not to the rights or claims of the majority owners, but to considerations of the public good and common welfare, as determined by the Legislature." (222 N.Y.S. 29.)

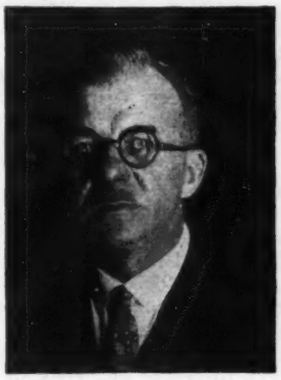
PROVISION THAT PURCHASER OF MUNICIPAL PLANT SHALL FURNISH LIGHT TO VILLAGE FREE NOT DISCRIMINATORY.—In Stone vs. Osborn it was attempted to enjoin the authorities of the village of Manchester, Ohio, from selling the municipal electric light plant. The Court of Appeals of Ohio sustained the sale, overruling technical objections and holding that a provision in an ordinance binding the purchaser to furnish free electrical energy to the village itself for ten years was not unlawful discrimination against the private consumer, even though it permitted non-consumers to obtain public lighting free. The sale of the plant to a former member of the municipal board of trustees who continued as a member until two days before he submitted a bid was not fraudulent or illegal, the court also held. (157 N. E. 410.)

COURT REFUSES TO DECLARE JAMES RIVER DAM A NUISANCE.—A controversy which in various phases has been in the courts for many years probably ended when the Virginia Supreme Court of Appeals refused a writ of error to the James River & Kanawha Power Company in its suit against the Old Dominion Iron & Steel Corporation, involving the continued existence of the latter's dam on the Richmond waterfront. The James River & Kanawha Power Company sought a review of the action of a lower court in dismissing the company's bill of complaint seeking to have the dam declared a private nuisance and the Old Dominion Iron & Steel Corporation enjoined from continuing to operate and maintain it. It was charged that the defendant by the erection of its concrete dam in 1904 had obstructed the flow of the James river to the riparian lands of the complainant and that, unless the defendant was compelled to remove the dam, such property would suffer irreparable damage.

News About Men of the Industry

Emanuel Anderson in New York

EMANUEL ANDERSON, who has been in charge of the field construction forces of the American Gas & Electric Company at Stanton, Pa., and Philo, Ohio, has established headquarters in the company's New York office as executive engineer of the mechanical department. Mr. Anderson will be in charge of all power-station construction throughout the American Gas & Electric properties, including both New York and field personnel, and will follow up the execution of all power-station and related projects from authorization to completion. All members



EMANUEL ANDERSON

of the mechanical department on contracts, engineering details and building work will be under his immediate supervision.

Mr. Anderson joined the American Gas & Electric Company in 1922, having previously been associated with Sargent & Lundy, engineers. His first work was supervision of the construction of the 80,000-kw. superpower plant at Philo, and later he was in charge of construction at the 90,000-kw. Stanton plant. Recently he has been in charge of the Philo extension, comprising a 165,000-kw. generator with necessary building and auxiliary equipment.

WILLIAM G. FURLONG has resigned as vice-president and manager of the Municipal Gas Company of Albany, a subsidiary of the Mohawk-Hudson Power Corporation. Mr. Furlong has served the company for 23 years, affiliating himself with the concern as secretary to the late Anthony N. Brady. He has served as a member of the board of education of Albany and has been a director of the Chamber of Commerce for several years. His resignation became effective Sept. 1. The Municipal Gas Company, which has an electrical department, is one of the subsidiaries of the Mohawk-Hudson Power Corporation which will be brought into the proposed consolidation of those companies serving cities in the Hudson and Mohawk valleys. Further plans await the action of the Public Service Commission of New York State.

A. L. POLLARD, assistant chief engineer of the El Paso (Tex.) Electric Company, has been transferred to the Tampa (Fla.) Electric Company in the same capacity. Both these properties are under the executive management of Stone & Webster, Inc.

JOHN B. REYNOLDS, director of industrial development of the Middle West Utilities Company, has been appointed a member and secretary of the civic development committee formed recently by the National Electric Light Association. The committee will co-operate with local organizations in the industrial and civic development of communities which are served by electric light and power companies.

ROY DEAN, formerly manager of the Sherman Electric Company, Moro, Ore., recently acquired by the Pacific Power & Light Company, has been appointed district manager of the Pacific company at Dayton, Wash., to succeed Roy Skill, who has assumed new duties in Pasco.

PAUL HECHT, who has been connected with the South Philadelphia works of the Westinghouse Electric & Manufacturing Company, has been appointed assistant to the vice-president, according to an announcement made by H. T. Herr, vice-president of the company. Mr. Hecht first became affiliated with the Westinghouse interests in 1905. During 22 years of service he has traveled extensively in Germany, Great Britain and Belgium.

G. E. MURRIE, who has been connected with the West Penn Electric Company for a number of years, has been elected secretary of that company. Mr. Murrie is also secretary of the West Penn Power Company and the West Penn Railways.

LEE S. OLNEY, manager of the Mississippi Valley Power Company since its organization in 1922, has resigned to affiliate himself with the Utilities Management Company of Chicago. Mr. Olney was engineer with the Commonwealth Public Service Company before it was absorbed by the Mississippi Valley Power Company, at which time it developed the territory along the Missouri Pacific Railroad in the Ozark district, the company serving fourteen towns and rural districts. Prior to this time Mr. Olney was manager of the electric and water plants at Monticello. He is a graduate of the University of Arkansas, class of 1905, and after graduation was associate professor of electrical engineering in the university until 1913. Mr. Olney has always taken a keen interest in the development of

utility service in the state and has been especially active as chairman of the educational committee of the University of Arkansas. In this connection he organized and conducted in collaboration with Prof. W. B. Stelzner a number of short courses at the College of Engineering for public utility employees.

F. C. GAINES, formerly superintendent of the Adairsville district of the Georgia Power Company, has been appointed superintendent of the new Jasper district. Mr. Gaines has been with the company for several years.

A. L. GATES, for a number of years manager of the Kansas Power Company's interests at Downs, has been appointed district superintendent at Smith Center.

F. W. KAPPLER, formerly auditor and assistant secretary of the Middle West Stock Transfer Company, has been made secretary of the Southwestern Light & Power Company of Oklahoma. His headquarters are in Oklahoma City.

THOMAS FINNERTY, who has been for sixteen years manager of the plant of the Otter Tail Power Company at Langdon, N. D., has resigned and will transfer his interests to the Pacific Coast.

E. E. GRAHAM, formerly electrical engineer with the East Texas Public Service Company, Marshall, Tex., has been appointed electrical engineer for the Southwestern Gas & Electric Company of Texarkana, Ark.

R. C. MCFADDEN, who has been district manager at Inglewood for the Southern California Edison Company, has been transferred to the general office as assistant new-business manager. CARL ELGAN, district manager at Lindsay, has been transferred to Inglewood to replace Mr. McFadden. H. V. BUSBY, chief clerk at Santa Barbara, has been transferred to Lindsay, being promoted to district manager. FRANK HAMILTON, district manager at Hanford, has been transferred to Fullerton as district manager, succeeding the late R. I. Carruthers, and JOHN WHITE from the Inglewood district has been promoted to the district managership of Hanford district.

C. A. KITTREDGE, superintendent of the southern division of the Alabama Power Company, Montgomery, has been transferred to Birmingham as superintendent of wholesale distribution to succeed E. W. Robinson.

J. P. TODD, who has been manager at Central City for the Kentucky Utilities Company, has been made manager at Somerset to succeed E. L. Shotwell, who resigned after ten years' service in that city. NILES O. JACKSON, manager at Dawson Springs for the last four years, has been promoted to be district manager for Dawson Springs, Princeton, Marion, Kuttawa and Eddyville, succeeding FRED VAN ARSDEL of Princeton, who replaces Mr. Todd at Central City.

E. N. HURLEY, JR., well known in the electrical manufacturing industry, has been elected president of the Electric Household Utilities Corporation, Chicago, to succeed Neil C. Hurley, resigned.

Patterson Leaves Alabama Commission

A. G. Patterson, president of the Alabama Public Service Commission for the past seven years, has tendered his resignation to Governor Graves and on Wednesday, Aug. 24, became probate judge of Morgan County, Ala, the county seat of which is Decatur. The outstanding achievement of Mr. Patterson was his complete reorganization of the commission and its methods soon after he was made president in 1920. Prior to that time the acts of the commission had been largely perfunctory. During the past few years the Alabama commission has been recognized as one of the best organized and most efficient in the Southeastern States. That Mr. Patterson's work received due acknowledgment is shown in his election as president of the National Association of Railroad and Utilities Commissioners in the fall of 1925. The service he rendered this national association has been substantial in solving utility problems and in setting up the necessary machinery to secure efficiency of regulation and fairness in administration.

A. PATTERSON, formerly superintendent of the electric department of the Southwestern Gas & Electric Company, Texarkana, Ark., has been appointed to the position of chief engineer. Mr. Patterson has been identified with the Southwestern organization since 1914, when he severed his connection with the Fort Smith (Ark.) Light & Traction Company. WALTER J. HEINRITZ, formerly associated with the Sioux City (Iowa) Gas & Electric Company, has been appointed to the position left vacant by the promotion of Mr. Patterson.

ROBERT E. KINKEAD has resigned as chief engineer of the welder division of the Lincoln Electric Company of Cleveland to engage in consulting engineering in connection with electric arc welding. Mr. Kinkead's office is in Cleveland. Starting early in the development of welding, Mr. Kinkead has become widely known among users of the arc-welding process through his fourteen years of engineering work in the field. Upon graduation from Ohio State College in 1913 he immediately joined the Lincoln Electric Company. Subsequently he became chief engineer for the Mitchell Company, Chicago, emergency master mechanics and welding contractors and after a short period as welding expert for the Western Electric Company at the Hawthorne plant in Chicago he returned to the Lincoln Electric Company as chief engineer, welder division. In this capacity he has acted as consultant to the many users of Lincoln arc-welding equipment and has written a number of technical papers for trade publications.

Obituary

FRANK F. THOMPSON, professor of electrical engineering at Rutgers University, New Brunswick, N. J., died Sept. 4 as the result of a fall from a window of the Coleman Hotel, Lewistown, Pa. He was born in Milroy, Pa., 57 years ago and was graduated from Princeton University in 1894. In the course of his academic career he spent one year as instructor of physics at Union College, Schenectady, N. Y., and three years as instructor in electrical engineering at Pennsylvania State College. He had been on the teaching staff at Rutgers since 1903, first as instructor in electrical science, later as assistant professor of physics and more recently as professor of electrical engineering.

DAVID M. MASSIE, counsel for various utility companies and formerly an Ohio state senator, died at his home in Chillicothe, in that state, on Sept. 3, after a long illness. Mr. Massie was born in Chillicothe in 1858, and during his legal and political career he was prominently identified with various activities in his native state. He was president of the First National and the Valley Savings Bank & Trust Company of Chillicothe. His connections in the field of law were extensive, he having been one of the leading counsel in untangling the affairs of the Columbia Railway, Power & Light Company prior to its reorganization.

ROY D. HUXLEY, associate professor of electrical engineering at the Case School of Applied Science, Cleveland, was killed at Niagara Falls, Sept. 2, when the automobile in which he was driving crashed through a rail at the edge of Niagara Gorge and plunged one hundred feet to a ledge. His wife and seven-year-old daughter, who accompanied him, also died, his wife instantly and the little girl a few hours later in a hospital at Niagara Falls. Before entering upon his academic career Professor Huxley spent four years in the engineering department of the American Telephone & Telegraph Company. In 1918 he became associate professor of electrical engineering at the Georgia School of Technology, Atlanta, severing his connection with that institution two years later to join the staff of the Case School in the same capacity. Professor Huxley was 38 years of age.

EVERLY HAINES, secretary of Curtis Lighting, Inc., Chicago, formerly the National X-Ray Reflector Company, died Aug. 30. Mr. Haines had been a member of the Curtis organization for 20 years.

Financial and Statistical News

Utility Stocks Very Active Merger Rumors a Factor New High Levels Established

SEVERAL of the public utility stocks are again becoming a center of trading interest in the security markets, and various factors have combined to produce higher levels. Following the lull preceding Labor Day, the volume of trading has increased very materially. Among the bull influences are merger rumors, continued ease in money and a continuation of the very favorable tenor of earnings statements. A recent study of the trend in market valuations of the various groups of stocks shows the utilities in a very favorable light. A large and representative group of these issues showed a gain of approximately 50 points, representing a value change of over $75,000,000, during August, while the gain during July was much greater. Moreover, while industrial leaders in many instances have misgivings with regard to the fall business outlook, and while earnings statements of many of the industrial concerns show decreasing profits, power and light company reports continue to show a gain even greater than normal in financial strength. Among the stocks presumably affected by merger rumors are Philadelphia Electric and United Gas Improvement, referred to elsewhere, and Westinghouse Electric & Manufacturing Company, which has a large stock interest in Philadelphia Electric.

As a measure of the stock movements in the power and light field, the ELECTRICAL WORLD index of common stocks made the largest weekly gain since May, standing now at 112 against 109 last week, 95 at the beginning of the year and 94 this week last year. American Gas & Electric, Edison Electric Illuminating of Boston, Philadelphia Electric and Public Service of New Jersey figured prominently in the rise.

On the curb market also utilities have been a feature. The most active stocks besides those already referred to were Lehigh Power Securities, United Light & Power A shares. Among the preferred issues American Light & Traction and American Power & Light were strong points.

Power and light bonds moved within narrow limits during the week and the turnover was relatively small. Some of the investment issues, however, moved forward under heavy buying. American Water Works & Electric 6's advanced to a new high of 106⅞. North American Edison general mortgage 5's sold at par, which was their previous high.

Customer-Ownership Stock Sales for June, $20,000,000

SALES of stock to customers, employees and other individuals in the communities served by central-station companies in June amounted to approximately $20,000,000 in value and consisted of 361,000 shares, sold in 28,800 transactions. This estimate is based on data compiled by the ELECTRICAL WORLD for companies serving about 85 per cent of the total number of customers on the lines of all companies that make a practice of selling stock locally.

Compared with May, the sales indicate a decrease of 20 per cent, but their value was only slightly below that for June, 1926. The low average value per share, $55, is accounted for by the fact that more than $5,000,000 was in the form of twenty-five-dollar shares, the remainder of the shares averaging close to $100.

Owing to the marked influence of any special activity during a given month these statistics are subject to somewhat greater uncertainty when returns are missing from even a single important company than is the case with most other data of the industry. For that reason they do not lend themselves to minute analysis. Thus, in June more than 50 per cent of the total receipts were reported by two companies, each selling about $5,000,000 worth of stock. In May one of these companies had similarly large sales, but no other reporting company reached any such figure, though several came close to $2,000,000. Consequently there are noticeable fluctuations from month to month.

SUMMARY OF CUSTOMER-OWNERSHIP STOCK SALES FOR FIRST HALF YEAR

Month 1927	Transactions	Shares, Thousands	Value
January	42,900	331	$25,700,000
February	22,500	204	15,700,000
March	33,600	350	29,500,000
April	31,000	293	24,700,000
May	46,500	409	24,000,000
June	28,800	361	20,000,000

That these are not balanced out in the national total is shown by the summary for the first six months. Viewed broadly it indicates rather high January sales, a decided slump in February substantially equalized by an unusual increase in March, and during the next quarter minor fluctuations at a slightly higher level than the monthly average for 1926.

Similarly, the monthly averages cover a wide range and appear to follow no definite cycle, though in the long run they are around $700 per transaction. The influence of special campaigns is evident in the temporary rise of the monthly total; when conducted by companies issuing shares at $25 or some other price notably under $100 it is reflected in the lowered average per share.

MONTHLY AVERAGES OF CUSTOMER-OWNERSHIP SALES

Month 1927	Average Price per Share	Average Price Per Transaction
January	$78	$600
February	77	700
March	84	880
April	60	800
May	59	520
June	55	690

Total sales for the half year were slightly in excess of those for the corresponding period of 1926, but the individual transactions are definitely larger, the earlier average sale being $570.

U. G. I.-Philadelphia Electric Merger Rumor Again Up

The recent activity in the stocks of the United Gas Improvement and Philadelphia Electric, creating new high levels in both, is attributed in financial circles to negotiations between the two companies to bring about what would be one of the largest public utility mergers yet consummated. Rumors persist that the United Gas Improvement Company is seeking control of the Philadelphia Electric with the object of placing the provision of gas and electricity in the city of Philadelphia under single control. The combined capital stock of the two companies is now almost $200,000,000, and combined book assets are in the neighborhood of $365,000,000. In discussing the matter with the ELECTRICAL WORLD, H. P. Liversidge, vice-president and general manager Philadelphia Electric Company, denied that the rumor was well founded, suggesting that such rumors had come up periodically for years and would probably continue to be found in circulation for years to come.

Putting two and two together, rumor goes further in suggesting that the Mellon interests of Pittsburgh have a hand in the alleged merger negotiations. After Arthur W. Thompson of Pittsburgh was elected president of the United Gas Improvement Company Richard B. Mellon was appointed a director of the latter organization. Furthermore, the Westinghouse Electric & Manufacturing Company has a stock interest in Philadelphia Electric, and W. L. Mellon is a director of the Westinghouse.

Heavy buying of stock of the both companies assumed to be by the same

interests, has had the effect of driving United Gas Improvement to a new high for the year of 118½ and Philadelphia Electric Company to its recent high of 55⅜.

Public Service Company to Offer Ten-Million Issue

The Board of Public Utility Commissioners of the State of New Jersey has authorized the Public Service Electric & Gas Company to issue 5 per cent gold bonds to the amount of $10,000,000. The board also authorized the issue of 2,000,000 shares of common stock of no par value.

Florida Power & Light Writes Off Damage

Notwithstanding the writing off of $1,650,000 by the Florida Power & Light Company as a result of the hurricane disaster of last September, the American Power & Light Company shows a 14 per cent increase in net earnings and a decidedly strengthened position as compared with the past year. Gross income increased 18 per cent and power output 18 per cent. The financial statement just issued shows an increase of almost 10 per cent in population served by all subsidiaries and an advance in total assets amounting to 15 per cent.

Following is a summary of the company's statement for the twelve months ended June 30 and an analysis of the company's operations during the past two calendar years.

AMERICAN POWER & LIGHT COMPANY
July 1, 1926, to June 30, 1927

	1926	1927
Gross income	$56,029,311	$61,913,987
Operating costs	31,223,215	34,263,271
Net income	24,806,096	27,650,716
Bond interest	2,289,680	3,007,467
Preferred dividends	1,404,383	1,430,174
Common dividends	2,274,767	2,419,901
Balance	5,610,901	6,517,358
Net per share common	4.70	4.87

ANALYSIS

	1925	1926
Electric customers	451,442	513,935
Kilowatt-hour output (000)	1,656,753	1,948,991
Kilowatt-hour output per customer	3,669	3,792
Net earnings per customer	$50.53	$50.60
Ratio net earnings to kilowatt-hours sold	0.015	0.014
Per cent increase in net	29	14
Per cent increase in output	24	18

Electric Refrigeration Strengthens Financial Set-up

The sale of 232,000 common shares by Electric Refrigeration Corporation to its shareholders is understood to have as its object the strengthening of the company's financial position. Expenditures of more than $6,000,000 have been made during the past year to improve the operating position of the company and to enhance its earning position. Further working capital, it is understood, will be realized from the sale of certain properties in Detroit not directly related to the company's major operations. Current assets at completion of present financing will exceed $10,000,000 against slightly over $2,000,000 of liabilities.

As a result of the year's plant readjustments the company's operations are largely concentrated at the Detroit plant, and it is said that overhead has been greatly reduced. Combining of the manufacturing departments of Kelvinator and Nizer alone effects a saving in excess of $500,000 annually. Cabinet work for the company's three major products is now carried on at Grand Rapids, Mich., while the bulk of the electric equipment is produced at the

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Sept. 6	Low 1927	High 1927
ABITIBI PWR. & PAPER, 4% com.—no par	109	83	109¼
Adirondack Pwr. & Lt.—7% pf.	112½	107	113½
Adirondack Pwr. & Lt.—8% pf.	115	112	116
Ala. Pwr., $7 cum. pf.—no par	112	107	112½
Allis-Chalmers Mfg., 7% pf.	m111¼	109	112½
Allis-Chalmers Mfg., 6% com.	114¼	88	114¼
Aluminum Co. of Amer., com.	105¼	67½	105½
Aluminum Co. of Amer., 6% of.	103	101½	104½
Amer. & Foreign Pwr., pf. 25% pd.	m110		
Amer. & Foreign Pwr., 7% pf.—no par	103½	86¼	105¼
Amer. & Foreign Pwr., com.—no par.	24¼	18¼	25½
Amer. Bosch Magneto, com.—no par	22½	13	23¾
Amer. Brown Boveri Elec†.	12½	5½	30½
Amer. Brown Boveri Elec., pf. $7	53	40	98
Amer. Gas & Elec., 6% pf.—no par	103½	95½	105½
Amer. Gas & Elec., com.†—no par	108	68¼	108
Amer. Lt. & Trac., 6% pf.	115	112	120
Amer. Lt. & Trac., new com.	172	164¼	178¼
Amer. Pwr. & Lt., 6% pf.	103½	97½	106½
Amer. Pwr. & Lt., com.†—no par	67	54	67½
Amer. Pub. Serv., 7% pf.	a 99½	94	104
Amer. Pub. Serv., com.†	70		
Amer. Pub. Utilities, 7% pfc. pf.	k 86½	73	88
Amer. Pub. Utilities, 7% pr. pf.	a 87½	92	96
Amer. Pub. Utilities, com.	k 53	65	70
Amer. States Sec., A.	4½	2½	4½
Amer. States Sec., B.	4½	2½	4½
Amer. Superpwr., 6% pfc pf.—25	m 29½	26½	29½
Amer. Superpwr., 6% 1st pf.	l 98½		
Amer. Superpwr., Class A†—no par.	38	27½	38½
Amer. Superpwr., Class B†—no par.	39½	28½	39½
Amer. Wtr. Wks. & Elec., 7% pf.	m111½	104½	111½
Amer. W. W. & E., com. new—no par	k 53½	46	53½
Anaconda Copper cap. $3	46½	41½	49½
Appalachian Electric Pwr., 7% pf.	103½	100	105
Appalachian Elec. Pwr., com.	m 78	77	83
Arizona Pwr., 7% pf.	k 70	77	84½
Arizona Pwr. com.	m 20	....	....
Arkansas Pwr. & Lt. 7% pf.	103½	....	....
Assoc. Gas & Elec., $3.50—50	51½	....	....
Assoc. Gas & Elec., pf.—$6—no par.	93	85	93
Assoc. G. & E., Class A, 10—no par.	42½	35	43
BABCOCK & WILCOX, 7% com.	115½	113	124
Binghamton L., H. & P., $6 pf.	98	93	100
Birmingham Elec., pf.—$7—no par.	107½	105	109
Blackstone Valley G. & E., 6% pf.	106	103	105
Blackstone Valley Gas & Elec., 10% com.—50	k140	98	153
Blaw-K nox, com.†	l 91	70	91
Brazilian Trac., Lt. & pwr., com.†	/187½	....	....
Broad River Pwr., 7% pf.	101	97	103
Brooklyn Edison, 8% com.	181	148½	184½
Buffalo, Niagara & East. Pwr., $1.60 pf.—25	l 25	....	..
Buffalo, Niagara & East. Pwr. com. $1—no par	l 39½	....	....
CALIFORNIA ELEC. GENERATING, 6% pf.	97	96	99½
California Ry. & Pwr., 7% pf.	135	125	150
Carolina Pwr. & Lt., pf.—$7—no par	/109½	....	....
Central & S.W. Util., $7 pf.—no par	a 97	92½	97½
Central & S.W. Util., pr lin $7 pf.—no par	a102½	98½	104½
Central Ariz. Lt. & Pwr., 8% pf.	k 97	95	98

Companies	Bid Price Tuesday Sept. 6	Low 1927	High 1927
Central Ark. Ry. & Lt., 7% pf.	106	100	104
Central Ill. Pub. Serv., $6 pf.	a 93	88½	95½
Central Ind. Pwr., 7% pf.	91	86	95
Central Pwr. & Lt., 7% pf.	101	100½	103
Central States Elec., 7% pf.	97	93	97
Central States Elec., com.†	m200		
Century Elec., 6% com.	m115	115	115
Chicago Fuse Mfg., com.—$2.50 no par	a 35½	30	35½
Cincinnati Gas & Elec., 5% com.	a 99½	96½	100
Cities Service, $6 pf—no par	l 90	87½	90½
Cities Service, pf. B—no par	l 81½	7[illegible]	8½
Cities Service, pf. BB—no par	l 82	81	85½
Cities Service, com.—20	l 49	40½	58
Cities Service, Bks. Shrs.—10	l 24½	22½	29½
Clarion River Pwr., 8% pf.	95	....	....
Cleveland Elec. Illg., 6% pf.	110½	108	112
Cleveland Elec. Illg., 10% com.	322	285	330
Columbia Gas & Elec., 6% pf.	106½	99½	107½
Columbia G. & E. com. $5—no par.	95½	82½	98½
Columbia Ry., Gas & Elec., 6% pf.	m 98	97	100
Columbus Elec. & Pwr., $2 com.—no par	70	[illegible]	....
Columbus Ry., Pwr. & Lt., 6% 1st pf.	103	[illegible]	104
Columbus Ry., Pwr. & Lt., 6½% pf. B	l 101½	9[illegible]	103½
Columbus Ry., P. & L., com.—no par	100	7[illegible]	105
Commonwealth Edison, 8% com.	a152	138	155
Commonwealth Pwr., 6% pf.	101	91½	101
Commonw'th Pwr., $2, com.—no par	61½	48½	61½
Conn. Lt. & Pwr., 6% pf.	121	119	123
Conn. Lt. & Pwr., 7% pf.	117	112	118
Cons. Gas of N. Y., pf.	99½	93	100
Cons. Gas of N. Y., com $5—no par.	114½	94	114½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf.	k105	105	107
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6½% pf.	a114	110½	114½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 7% pf.	a116½	112½	117
Cons. Gas, Elec. Lt. & Pwr. of Balti., 8% pf.	a130	127	130½
Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $2.50—no par	a 62½	51	62
Consolidated Pwr. & Lt., 7% pf.	105	100	106
Consumers Pwr., 6% pf.	103½	100	102
Consumers Pwr., 6.6% pf.	105½	103	105½
Continental Gas & Elec., 8% pfc. pf.	108½	103	106½
Continental Gas & Elec., 7% pr. pf.	103	100	103
Contl. G. & E. com. $4.40—no par.	200	210	225
Crocker Wheeler, com.†	25	30	38
Crocker Wheeler, 7% pf.	82	78	88
DALLAS PWR. & LT., 7% pf.	109½	107	110½
Dayton Pwr. & Lt., 6% pf.	k106	101	107
Detroit Edison, 8% com.	153	133½	157
Dubilier Condenser, com.—no par	k 3	2½	5½
Duquesne Lt., 7% pf.	k115	114½	116½
EASTERN NEW YORK UTIL., $7 pf.	107	102	104½
Eastern New York Util. com.	65	70	75
Eastern States Pwr., $7, com.	9	9	13
Eastern States Pwr., pf.	90	90	95
East. Tex. Elec., 7% pf.	106	106	108
Edison Elec. of Boston, $12 com.	d252	217	267

Companies	Bid Price Tuesday Sept. 6	Low 1927	High 1927
El Paso Elec., 7% pf.	108	105	107½
Elec. Bond & Share, 6% pf.	/108½	105½	109½
Elec. Bd. & Sh. Sec., com. $1—no par	l 76½	66½	79½
Electric Household Util.†	a 13½	11	15½
Elec. Investors, 6% pf.—no par.	98	92	96
Elec. Investors, com.†—no par.	39½	32½	40½
Elec. Investors, 10% pd. receipts	m 15	....	....
Elec. Pwr. & Lt., ctfs. pf.	105½	96	106½
Elec. Pwr. & Lt., ctfs., 40% pd.	116	103½	116
Elec. Pwr. & Lt., ctfs, full pd.	m114	108½	111½
Elec. Pwr. & Lt., ctfs., com.—no par.	28	16½	28
Elec. Refrig. cap.†	15½	12½	37½
Elec. Ry. Securities, com.—no par.	6½	....	....
Elec. St. Battery com. $5.25—no par	71½	63½	79½
Elmira Wtr., Lt. & R.R., 7% pf.	103	99	101½
Emerson Elec., pf.	m109	107½	111
Empire Pwr., ptc.†	34½	26	39
Engr. Pub. Serv., $7 pf.—no par.	m104½	93½	106½
Engr. Pub. Serv., com.—no par	34	21½	34
Eureka Vacuum Cleaner, com. $4—no par.	69½	50	77
FAIRBANKS MORSE, 7% pf.	k105	107½	112
F.-M., com.—$3—no par.	39½	37½	43½
Federal Lt. & Trac., com. $1.40	42½	37½	47
Federal Lt. & Trac., $6 pf.—no par.	k 98	91½	100
Ft. Worth Pwr. & Lt., 7% pf.	/111	....	....
GALVESTON-HOUSTON ELEC. 6% pf.	70	68	72
Galveston-Houston Elec., com.	26	26	32
Gen. Elec., $3 com.—no par.	146	81	146
Gen. Elec., special—6%	11½	11	11½
Gen. Gas & Elec. (Del.) com. A. $1.50—no par.	42½	34	47½
Gen. G. & E. (Del.) com. B—no par.	m 45	35½	44½
Gen. G. & E. (Del.) pf. A. $8—no par.	k115	113½	120
Gen. G. & E. (Del.) pf. A $7—no par.	k107	100	109½
Gen G. & E. (Del.) pf. B $7.	k103	96	105
Gen. Pub. Serv., $7 cum. pf., no par.	k107	102	106
Gen. Pub. Serv., com., no par.	14½	11½	15½
Ga. Lt., Pwr. & Rys., 6% pf.	92	87	96
Ga. Lt., Pwr., & Rys., com.	m 50	50	80
Ga. Ry. & Pwr., 8% pf.	k123	119	125
Ga. Ry. & Pwr., 7% pf.	k113½	106	110
Gt. Western Pwr., 7% pf.	h103	....	....
IDAHO PWR., 7% pf.	106	103	109
Ill. No. Utilities, 6% pf.	k 88	88	92
Ill. Pwr. & Lt., 7% pf.	l 102	99	101½
Ingersoll Rand com. $8	k 90	88½	96½
Int. Combus. Engr., com. $2—no par	50½	43½	64
Int. Util., Class A—$3.50—no par.	44½	28	44½
Int. Utilities, Class B—no par.	6½	3	7½
Interstate Pwr., pf.—$7—no par.	95	93	98
Interstate Pub. Serv., 7% pf.	99	98	99½
Iowa Ry. & Lt., 7% pf.	98	97	99
JERSEY CENTRAL PWR. & LT. CO., 7% pf.	102	97½	103
Johns-Manville, com.†—no par.	119½	55½	120

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid price Saturday, Sept. 3. *l*Bid price Wednesday, Sept. 7. *m*Latest quotations available. †Dividend rate variable.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Sept. 6	Low 1927	High 1927
KANSAS CITY PWR. & LT. pf.$7	115	112	115½
Kansas Gas & Elec., 7% pf.	*l*106½	....	....
Kentucky Hydro-Elec., 7% pf.	*a* 97½	94½	100
Kentucky Sec., 6% pf.	86	83	87
Kentucky Sec., 5% com.	109	110	115
Kentucky Utilities, 6% pf.	99½	95	98½
Keystone Pwr. & Lt., pf.	*m* 98	95	100
LACLEDE GAS LT., 12% com.	*k* 225	173½	267½
Lehigh Pwr. Sec., com.—no par.	20½	15	20½
Long Island Ltg., 7% pf.	109½	107	112
Long Island Ltg., com.†—no par	154	139	153
Los Angeles Gas & Elec., 6% pf.	*l*102½	98	104½
Louisville Gas & Elec., cl. A. $1.75	27	23½	27½
MAN. ELEC. SUPPLY, cap. $5—no par	55	50	132
Manila Elec., com.†—no par	*k* 47	40	50
Maytag Mfg., com. .50—no par	31½	23½	34½
Memphis P. & L., pf.—$7—no par	109	107	109
Metropolitan Ed., pf.—$6—no par.	100	93	100
Metropolitan Ed., pf.—$7—no par.	107	104	108
Metropolitan Ed., com. $5—no par.	*k* 70	60	72
Middle West Utilities, 6% pf.	*a*112½	110½	112½
Middle West Util., 8% pr. lien	*a*121½	117½	122½
Middle West Util., com. $6—no par ex. div.	*a*113½	108	117½
Midland Utilities, pr. in. 7% pf.	*a*106	92½	106
Midland Utilities, 6% pf. A	*a*102½	92½	102½
Milwaukee Elec. Ry. & Lt., 7% pf.	*k*102	100	103
Milwaukee Elec. Ry. & Lt., 6% pf.	*k* 98½	98	101½
Minn. Pwr. & Lt., 7% pf.	*k*106	103	107
Miss. Pwr. & Lt., $8 pf.	*m*101	106	103
Miss. River Pwr., 6% pf.	102	94	103
Miss. River Pwr. 3% com.	62	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par.	105	100	109
Mohawk Hudson Pwr., 2d pf.—$7—no par.	104	98	112
Mohawk Hudson Pwr., com.—no par	30½	20½	32½
Montana Pwr., 7% pf.	*m*106½	118½	106½
Montana Pwr., 5% com.	102½	81½	106½
Montreal Pwr., 7% com.	*f* 96	....	....
Mountain States Pwr., 7% pf.	100	97	101
Mountain States pwr., com.†	18	....	....
NASSAU & SUFFOLK LTG., 7% pf.	107	98	105
National Carbon, 8% pf.	*m*139½	130½	139½
National Elec. Pwr., A†	*a* 24½	23½	25½
National Lt., Ht. & Pwr., com.	24	....	....
National, Light, Ht. & Pwr., 5% pf.	70	....	....
National Pwr. & Lt., pf.—$7—no par	106	101	108½
National Pwr. & Lt., com.†—no par.	24½	19½	24½
National Pub. Serv., 7% pf.	97	93	100
National Pub. Serv., 7% ptc., pf.	113	108	115
National Pub. Serv., A com. $1.60—no par.	22½	18½	24
National Pub. Serv., B com.—no par	*k* 18	14	20½
Nebraska Pwr., 7% pf.	*l*109	....	....
Nevada-Calif. Elec., com.	*k* 27½	25	31
New Brunswick Pwr., 4% pf.	60	....	....
New Eng. Pub. Serv., pr. in. pf. $7.	102	98½	101
New Eng. Pub. Serv., pf. $7.	97	95	97½
New Orleans Pub. Serv.—7% pf.	104	103	105½
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	90	91	97
N. Y. Central Elec., 7% pf.	102½	101	104
Newport News & Hampton Ry., Gas & Elec., 5% com.	109	....	....
Newport News & Hampton Ry., Gas & Elec., 7% pf.	109	....	....
Niagara Falls Pwr., 7% pf.—25.	28½	27½	29½
Niagara, Lock. & Ont. Pwr., 7% pf.	111	110½	113
No. Amer., 6% pf.—50.	52½	50	55
No. Amer., com.—10	58	45½	58½
No. Amer. Edison, $6 pf.—no par.	*k*102½	96½	102½
No. Caro. Pub. Serv., pf.—$7—no par	100½	93	102½
Northeastern Pwr., com.	20	14½	20½
No. N. Y. Utilities, 7% pf.	105½	103	109
No. Ohio Pwr., com.—no par.	15½	9½	15½
No. Ohio Trac. & Lt., 6% pf.	83	78	81
No. Ohio Pwr. & Lt., 7% pf.	94	90	93
No. Ont. Lt. & Pwr., 6% pf.	*k* 91	84	95
No. Ont. Lt. & Pwr., 4% com.	72	73	78
No. States Pwr., (Del.) 7% pf.	105	101	107½
No. States Pwr., (Del.) 8% com.	120½	....	....
No. Texas Elec., 6% pf.	62	65	70
No. Texas Elec., com.	22	27	36
OHIO BRASS, com. B $4—no par.	82	76	85
Ohio Brass, 6% pf.	105	100	105
Ohio Pwr., 6% pf.	100½	96	103
Ohio Pub. Serv., $6 pf.	98	95	96½
Ohio Pub. Serv., 7% pf.	105	103	109
Ohio River Edison, 7% pf.	108½	103	109½
Oklahoma Gas & Elec., 7% pf.	100	....	....
PACIFIC GAS & ELEC., 6% pf.	26½	24½	26½
Pacific Gas & Elec., 8% new com.	40	31	40½
Pacific Pwr. & Lt., 7% pf.	*l*105	....	....
Penn Cent. Lt. & Pwr., $5 pf.—no par	*c* 77	75½	77½
Penn-Ohio Edison, 7% pf.	*k*102	97½	104
Penn-Ohio Elec., 7% pf.	*m*101½	98	100
Penn-Ohio Pwr. & Lt., 7% pf.	106	99	103
Penn Pwr. & Lt.—$7—no par.	*l*108½	....	....
Penn Wtr. & Pwr., 8% com., new	*c* 58½	47½	58½
Phila. Co., 6% pf.—50.	*c* 52½	49½	52½
Phila. Co., com.—50.	*k* 103	85½	110
Phila. Elec., 8% com.—25.	*c* 55½	46½	55½
Portland Elec. Pwr., 7% pf.	99	97½	101
Portland Elec. Pwr., 6% pf.	79	75	83
Portland Elec. Pwr., 6% 2d pf.	58	55	70
Portland Elec. Pwr., com.	28	22	30
Potomac Elec. Pwr., 6% pf.	*m*108½	....	....
Pwr. Corp. of N. Y., com. $1—no par	*m* 79	....	....
Pwr. Sec., pf.—no par.	*k* 29	28	33
Pwr. Sec., com.—no par.	*k* 6	5	8
Public Serv. of Colorado, 7% pf.	*l*102	....	....
Pub. Serv. of N. J., 6% pf.	100½	98½	101½
Pub. Serv. of N. J., 8% pf.	*k*129½	125	132
P. S. of N. J., $2 com.—no par.	43½	32	45½
Pub. Serv. of No. Ill., 6% pf.	*a*106½	101½	106½
Pub. Serv. of No. Ill., 7% pf.	*a*117	112½	117
P. S. of No. Ill., com. $8—no par.	*a*140½	130½	143
Pub. Serv. of No. Ill. $8 com.	*a*140½	132	142
Pub. Serv. of Okla., 7% pr. in.	100	99	100½
Pub. Serv. Elec. & Gas, 6% pf.	107½	102	108½
Puget Sound Pwr. & Lt., 7% pr. pf.	106½	105	107
Puget Sound Pwr. & Lt., $6 pf.—no par.	88	....	....
Puget Sound Pwr. & Lt., com.	31	28	35½
RADIO CORP. OF AMER., $3.50 pf.—50.	*k* 65½	49	54½
Radio Corp. of Amer., com.—no par.	64½	41½	68½
Republic Ry. & Lt., pf.	*m*120	....	....
Republic Ry. & Lt., com.	*m*135	112	135
Rochester Gas & Elec. 6% pf. D.	*l*104½	101	103½
Rochester Gas & Elec., 7% pf. B.	103½	105	107
Rochester Gas & Elec., 6% pf. C.	104½	101½	103½
SAFETY CABLE, com. $4.	64	52½	74½
San Joaquin Lt. & Pwr., 7% pr. pf.	106	105	108
St. Joseph Ry., L., H. & P., 5% pf.	72	70	73
Servel Corp.	*k* 1½	1	10½
Sierra Pacific Elec., 2% com.	*k* 26½	24½	28½
Sioux City Gas & Elec., 7% pf.	102	99	104
Southeastern Pwr. & Lt., pf.—$7 no par	*l*108	....	....
Southeastern Pwr. & Lt. ptc. pf.	*l* 82	....	....
Southeastern Pwr. & Lt., com.—no par.	37½	29½	38½
So. Calif. Edison, 8% pf.	39	36	40
So. Calif. Edison, 7% pf.	*k* 28½	27	28½
So. Calif. Edison, 6% pf.	*k* 26	24	27
So. Calif. Edison, 8% com.	38	31½	38
Southern Cities Utilities, 7% pf.	*k* 70	67	90½
Southern Cities Utilities, com. $4.	*m* 31½	23½	42½
Southwestern Lt. & Pwr., A $3.	63	60	65
Southwestern Lt. & Pwr., B.	63	60	65
Southwestern Lt. & Pwr., $6 pf.	89	83	91½
Southwestern Pwr. & Lt., 7% pf.	108½	104	110
Springfield (Mo.) Ry. & Lt., 7% pf.	102	95	102
Standard Gas & Elec., 8% pf.	64½	57½	64½
Standard Gas & Elec., 7% pr. pf.	107½	103	110
Standard G. & E., com. $3.50—no par	64½	54	65½
Standard Pwr. & Lt., 7% pf.	100	98	102½
Staten Island Edison, pf.—$6—no par.	100	99	101
Superheater, $6 com.—no par.	172	170	185
Syracuse Lighting, 7% pf.	105	103	107
Syracuse Lighting, 8% pf.	115½	....	....
Syracuse Lighting, 8% com.—no par	*m*300	....	....
TAMPA ELEC., com. $2.	58	....	....
Tenn. Elec. Pwr., 6% pf.	98	92	99
Tenn. Elec. Pwr., 7% pf.	107½	103	109
Terre Haute, Ind. & East. Trac., 5% pf.	26	20	30
Terre Haute, Ind. & East. Trac., com	1	1	3
Tex. Pwr. & Lt., 7% pf.	*l*109	....	....
Tide Water Pwr., 8% pf.	109	105	110
Timken Roller Bear., com.—$4 no par.	129½	78	142½
Toledo Edison, 8% pf.	115	115	118
Toledo Edison, 7% pf.	*l*105½	....	....
Toledo Edison, 6% pf.	*k* 98	95	97
Toledo Edison, 6% com.	98	....	....
Tri-City Ry. & Lt., 6% pf.	97	90	97
UNITED GAS & ELEC., 6% pf.	101	98	102
United Gas & Elec., com.—no par.	*m* 57	....	....
United Gas & Elec. (N. J.) 5% pf.	72	70	73
United Gas Impr., 8% com.—50.	*c*118½	89½	118½
United Lt. & Pwr., pf.—$4—no par.	54	49	55
United Lt. & Pwr., pf.—$6.50—no par.	96	87	97½
United L. & P., com. A .48—no par.	14½	12½	15½
United L. & P., com. B .48—no par.	21½	15	21½
Utah Pwr. & Lt., 7% pf.	*l*107	....	....
Utica Gas & Elec., 7% pf.	105	105	106½
Utica Gas & Elec., 8% com.	200	....	....
Utilities Pwr. & Lt., 7% pf.	95	93	100
Utilities Pwr. & Lt., com. A $2.	32½	27	34
Utilities Pwr. & Lt., com. B $1—no par.	*k* 20	13½	20
VERMONT HYDRO-ELEC., 7% pf.	98½	95	100
Virginia Elec. & Pwr., 7% pf.	108	105	110
Virginian Pwr., 7% pf.	108	....	....
Virginian Pwr., com.	75	....	....
WAGNER ELEC., 7% pf.	*b* 87½	68	90
Wagner Elec., com.—no par.	*b* 32	18½	39½
Washington Ry. & Elec., 5% com.	259	180	275
Washington Ry. & Elec., 5% pf.	91½	....	....
Washington Wtr. Pwr., 8% com.	164	136	168
West Penn Elec., 7% pf.	110½	102	112
West Penn Elec., Cl. A $7.	109	97½	110
West Penn Pwr., 7% pf.	114½	111	118
West Penn Pwr., 6% pf.	107½	100½	108½
West Virginia Lt., Ht. & Pwr., 7% pf.	92	94	96
West Va. Utilities, 7% pf.—50.	*m* 90	48	51½
Western Pwr., 7% pf.	103	97½	103
Western States Gas & Elec., 7% pf.	99½	96	105
Western States Gas & Elec., com.	38	....	..
Westinghouse Elec. & Mfg., 8% com.—50.	87½	67½	89
Weston Elec. Instrument, Cl. A $2—no par.	*k* 31½	30	34½
Weston Elec. Instrument, com.—no par.	*k* 13	12½	18½
Wheeling Elec., 6% pf.	101	95	104
Worthington Pump, 7% pf. A.	*k* 52	46	61½
Worthington Pump, 6% B.	46	40	54½
Worthington Pump, com.	34½	20½	46
YALE & TOWNE com. $5—25.	84	70½	84½

Stock Exchange: *a*Chicago; *k*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f* Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid price Saturday, Sept. 3. *l*Bid price Wednesday, Sept. 7. *m*Latest quotations available. †Dividend rate variable.

Detroit plant. Total sales for the year are expected to exceed $21,000,000, as against $18,000,000 for 1926, and the operating costs will be in the neighborhood of $3,000,000 less per year than before.

CALIFORNIA-OREGON POWER COMPANY ADDS $15,000,000 TO CAPITALIZATION.—Stockholders of the California-Oregon Power Company on Aug. 15 increased the capital stock from $15,000,000 to $30,000,000. This addition to capitalization will include an increase in the authorized common shares from 75,000 to 150,000 and an increase of similar proportions in the preferred shares. Under the new arrangement there will be 44,200 shares of 7 per cent preferred stock, 10,000 shares of 6 per cent preferred stock and 95,800 shares of 1927 series preferred stock, all of which are redeemable at 110 on 60 days' notice.

Company Reports

Name of Company	Gross Earnings Twelve Months Ended July 31 1927	1926
Carolina Power & Light	$8,705,432	$7,678,425
Engineers' Public Service	28,555,123	25,156,416
Federal Light & Traction*	4,029,034	3,731,469
Fort Worth Power & Light	2,895,578	2,868,482
Nebraska Power	4,637,149	4,293,449
Pacific Power & Light	3,692,330	3,717,373
Public Service Co. of New Hampshire and subs.*	2,050,886	2,046,077
Texas Power & Light	8,878,088	7,234,157
York Utilities*	115,671	123,025

* Seven months ended July 31.

DIVIDEND ON UNISSUED STOCK CUT.—Stockholders of the Pennsylvania Power Company, one of the Penn-Ohio Edison group, have approved reducing the annual dividend rate on 50,000 authorized but unissued shares of no-par preferred stock from $7.20 to $6. Pennsylvania Power has outstanding 56,500 shares of common and 4,344 shares of $6.60 preferred stock.

LOCKPORT (N. Y.) UTILITY SELLS PREFERRED STOCK PRIVATELY.—Seven per cent cumulative preferred stock of the Lockport Light, Heat & Power Company has been sold privately to the amount of $100,000 at 105 and dividend, yielding about 6.70 per cent. The stock was issued against capital expenditures heretofore made and for other corporate purposes.

MORE UTILITY SECURITIES ADDED TO LIST.—The New York Stock Exchange has authorized the listing of 175,288 additional shares of 6 per cent cumulative preferred stock of the Public Service Corporation of New Jersey (par $100 per share) on official notice of issuance and payment in full, making the total amount applied for 413,111 shares. There has also been authorized the listing of 26,553 additional shares of class A stock of the Utilities Power & Light Corporation without par value

(total authorized 1,000,000 shares) on official notice of issuance and payment in full, with further authority to add 40,000 additional shares now covered by an option on or before Oct. 1, 1927, when and as taken up, on official notice of issuance and payment in full—it being understood that if the 40,000 shares are not taken up on or before Oct. 1, 1927, the authority granted shall lapse as to the portion thereof not so taken up—making the total amount applied for 501,500 shares of class A stock. The Exchange has authorized the listing of five-year 6½ per cent sinking-fund debentures of the Berlin City Electric Company, Inc. (Berliner Städtische Elektrizitätswerke Aktien Gesellschaft) to the amount of $20,000,000. These debentures are dated Dec. 1, 1926, and fall due Dec. 1, 1951.

New Boards Selected for P. G. & E. Companies

One of the initial steps taken by the Pacific Gas & Electric Company in pressing the consolidation of the properties acquired from the Standard Gas & Electric Company was to replace the board of directors of the Western States Gas & Electric Company and the Coast Valleys Gas & Electric Company with Pacific Gas & Electric officials, virtually all of the former Byllesby directors retiring. A. F. Hockenbeamer, new president of the Pacific Gas, is president of both the Western States Gas & Electric and the Coast Counties Gas & Electric; F. A. Leach, Jr., is vice-president and general manager of both, and D. H. Foote is secretary and treasurer of both companies. The new boards are identical with one exception in the case of each company. C. S. Northcutt, now vice-president of Western States, also becomes a director, and James F. Pollard, vice-president and general manager of Coast Valleys, has a seat on that board. Other directors of both companies are L. H. Susman, P. M. Downing, W. S. Yard, W. G. Vincent and R. E. Fisher. Mr. Pollard has been carried over from the Standard Gas régime. The board of the Coast Valleys remains the same size as before, nine, while that of the Western States is increased from seven to nine owing to the change.

International Paper Company Large Factor in Power

Recent acquisition of control of the New England Power Association by the International Paper Company establishes this company as one of the leading water-power owners of the North American Continent and, therefore, an important factor in the public utilities field.

The present development program of the International Paper calls for completion by 1928 of four hydro-electric plants with total installed generating capacity of 397,500 hp. The majority of the company's mills use the output of these developed water powers and the surplus output is sold to public utilities. In order to segregate the company's water-power properties the International Hydro-Electric Company was incorporated in 1925. In March, 1926, the New England Power Association purchased power rights at Bellows Falls, Vt., formerly belonging to the International Paper Company, in exchange for 90,000 shares of New England Power Association common stock. International Paper retained over 30,000 shares. This gave International Paper over 116,000 shares of the New England Power Association stock. The company also controls the Gatineau Power Company, which is one of the important Canadian hydro-electric developments. International Paper's power properties are carried at $35,377,745, but many of the company's water powers and some of its hydro-electric developments are not included in this figure, being included with mill properties, which were carried at $41,185,954 for Canadian mills and $29,849,971 for plants in the United States. Last year the Milton mill was sold by International Paper, as was the water power at the former mill at West Enfield. In both cases the purchasers plan to use the property for hydro-electric development rather than for pulp or paper mill purposes.

CITIES SERVICE GROWTH SHOWN IN REPORT.—Rapid growth in the power and light industry since 1915 is described in a report of the operations of the properties of the Cities Service Power & Light Company. The company produces about one-fifteenth of the total output of an industry that represents an investment of $15,000,000,000. Of the company's earnings about 66 per cent are received from its electric properties and 28 per cent from gas, the remainder coming from other public utility enterprises. The stock of Cities Service Power & Light Company in the hands of the public consists of 6 per cent and 7 per cent preferred stock, amounting to $17,000,000. All of the $65,000,000 par value of common stock is owned by Cities Service Company. The latter company is one of the ten largest corporations in the country, with assets of more than $600,000,000.

MASSACHUSETTS LIGHTING STOCKHOLDERS TO EXCHANGE SHARES FOR INVESTMENT TRUST SHARES. — Stockholders of the Massachusetts Lighting Companies have been offered the opportunity of exchanging their trust certificate shares for 5 per cent participating preferred (par $50) and common voting-trust shares (no par value) of Massachusetts Utilities Investment Trust, the exchange being subject to the approval of the exchange committee of the Massachusetts Utilities Investment Trust. The board of trustees of the Massachusetts Utilities Investment Trust will include all of the trustees of the Massachusetts Lighting Companies. This offer of exchange will remain in effect until Sept. 15, 1927.

CINCINNATI UTILITY CALLS BONDS. —All of the outstanding prior lien and refunding mortgage sinking-fund gold bonds of the Cincinnati Gas & Electric Company have been called for payment Oct. 1 at 110 and interest. These 7 per cent bonds, series A, are dated Jan. 1, 1921, and mature Jan. 1, 1961. In addition, certain of the first and refunding mortgage 5 per cent 40-year sinking-fund gold bonds, dated April 1, 1916, and due April 1, 1956, aggregating $174,000, have been called for payment Oct. 1, 1927, at 102 and interest.

DERBY GAS & ELECTRIC REPORTS REVENUE FIGURES. — The Derby (Conn.) Gas & Electric Corporation and subsidiary and controlled companies in their consolidated statement of revenue and expenses for twelve months ended June 30, 1927, report gross revenues of $1,388,456, expenses of $595,857 and net earnings after fixed charges, but before provision for renewals and replacement and federal income tax, of $289,499.

JAPANESE COMPANY ISSUES STATEMENT FOR JUNE.—The Tokyo Electric Light Company, Ltd., derived gross revenue of $3,248,859 (converted at 50 cents per yen) from the sale of 163,280,893 kw.-hr. during the month of June, 1927. The increase during the month of connected load showed a gain of 477 kw. in lighting, heating and domestic load and 2,607 kw. in power for industrial and other purposes. The total maximum demand on the company's system during June was 377,829 kw. The total load connected to the mains at the beginning of the month included 245,340 kw. for light, heating and domestic load and 393,017 kw. for industrial and other power purposes.

STANDARD GAS & ELECTRIC CUSTOMER SALES INCREASE 54 PER CENT.—Customer-ownership sales of preferred shares of the operated properties of the Standard Gas & Electric Company for the first six months of 1927 totaled $18,582,400 par value, an increase of 54 per cent over the corresponding period of 1926. There were 22,605 separate transactions, or an average of $822 par value per sale. Operating companies distributing their preferred shares under the customer-ownership plan of equity financing included the California-Oregon Power Company, Coast Valleys Gas & Electric Company, Louisville Gas & Electric Company, Mountain States Power Company, Northern States Power Company, Oklahoma Gas & Electric Company, Southern Colorado Power Company and Wisconsin Public Service Corporation. Louisville Gas & Electric Company and Southern Colorado Power Company have temporarily discontinued the sale of their preferred shares under this plan, while the Coast Valleys Gas & Electric Company is no longer a part of the Standard Gas & Electric Company's system, its properties recently having been merged with those of the Pacific Gas & Electric Company. Customer-ownership sales of preferred shares at the operated properties of the Standard Gas & Electric Company during the month of July totaled $955,300 par value, there having been 1,513 separate transactions.

Business News and Market Conditions

August Awards Above Those for July

Engineering Construction Contracts Let in 1927 Continue to Be Ahead of Those Closed in the Same Period Last Year

CONTRACTS awarded in the United States for August, 1927, were $289,344,000, which is 20 per cent more than awards for July and 19 per cent more than for August, 1926. The total since Jan. 1 of $2,044,973,000 is 7½ per cent higher than for the same period last year, according to the *Engineering News-Record.*

All classes of construction except industrial works and federal government contracts show an increase over last month. New England shows a slight decrease from last month's total for all classes. The Middle West shows the most spectacular increase, the total for that section being about 70 per cent higher than last month. Commercial contracts in Illinois and Michigan are about five times as large as last month. These states compared with last year, however, register a less conspicuous change. The Illinois figure is slightly lower than that for August, 1926, and Michigan is about twice as high. From Jan. 1 this year the Middle West has increased only about 6 per cent over last year.

Contracts Generally Higher

The total contracts for the Southern States since the first of the year are lower than last year, but all other sections are higher. The only classes of construction which have lower totals for this year to date are streets and roads, industrial works and federal government. Excavations are 75 per cent higher than last year. The following changes over 1926 are of significant magnitudes: Increases — bridges, 50 per cent; unclassified, 42 per cent; sewers, 19 per cent. Decreases—industrial works, 19 per cent; federal government, 16 per cent. In various sections of the country important changes are: Far West, 30 per cent increase; west of Mississippi, 25 per cent increase; Southern, 25 per cent decrease. Contract values in the accompanying table are based on a minimum for each class, as follows: Waterworks, excavation, drainage, irrigation, levee, river and harbor projects, $15,000; other public works, $25,000; industrial buildings, $40,000; commercial, educational, institutional, religious and other buildings, $150,000. These figures are for the entire United States.

The construction volume index number for the month of August was 306, as compared with 228 for the whole of 1926 and 100 for 1913.

The construction cost index number for Sept. 1 is 1 per cent below that of Aug. 1, 1927. The decrease is owing to slightly lower wage rates. General construction cost is thus 2 per cent below that of August, 1926, and 20 per cent under the peak, while it is 104 per cent above that of 1913. Labor rates and conditions throughout the country are reasonably good. For the iron and steel industry as a whole the average earnings per hour were 63.7 cents in 1926, according to a report of the Department of Labor covering 75,000 employees in the ten departments. The peak was in 1920 and was 74½ cents, while in 1922 a low rate of 51.3 cents was reached. In 1924 the average rate was 64.4 cents. Earnings in 1926 were two and one-eighth times those of 1913.

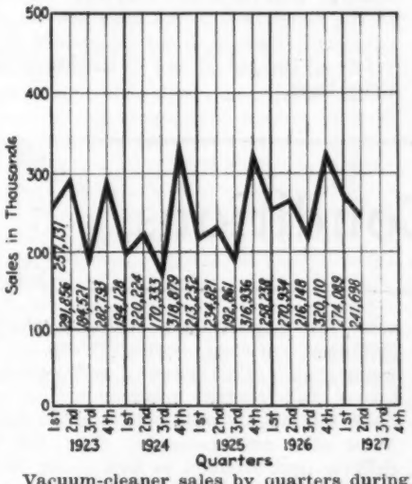
Foreign Construction Projects

A recent decree of the President of Venezuela provides for an additional credit of $380,000 for the Department of Public Works. All the money that the department now has at its command, more than $7,000,000, will be spent for the construction of public works and purchase of materials.

The government of Chile has provided $4,800 for preliminary studies to be made by engineers of the office of the Inspector General of Ports, Santiago, in connection with the construction of adequate ports for Valdiva, to cost £1,000,000. Bids for the construction work will be called this month. The Argentine government will construct the Costanro Canal with government-owned machinery. The necessary dredging has already been carried out in part, the average depth being 10 ft. Any additional equipment will be purchased after the annual publication of tenders in the *Bolletin Official.*

Exemption from taxation has recently been granted by law to any official or corporation constructing a hotel in Bahai, Brazil. The plans of the hotel must be approved by the Governor of the State of Bahai and municipal authorities, the construction to begin within 60 days after approval. It must be a first-class hotel. The commission appointed by the Podesti of Milan, Italy, in January to study the possibility of constructing a subway recently submitted its reports recommending the construction of two comparatively short tunnels to contain four principal surface lines. The construction is planned to start this year and to be completed in two years.

Vacuum-Cleaner Sales



Vacuum-cleaner sales by quarters during 1923, 1924, 1925, 1926 and the first and second quarters of 1927. (Data supplied by Vacuum Cleaner Manufacturers' Association.)

Value of Contracts Let in the United States and Canada During August, 1927

(Thousands of dollars—000 omitted)

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States	Jan. 1 to Date, U.S.	Canada
Waterworks	$655	$1,394	$856	$882	$2,440	$1,673	$7,900	$41,213	.....
Sewers	603	620	648	7,730	1,393	2,925	13,919	77,181	$1,063
Bridges	167	2,266	1,006	1,471	1,958	785	7,653	79,691	2,246
Excavations, drainage, etc.	25	264	18	598	1,081	769	2,754	34,320	194
Streets and roads	1,395	10,425	8,379	11,507	12,993	7,277	51,976	334,185	1,735
Industrial buildings	3,277	3,983	1,481	2,446	6,244	3,183	20,614	172,966	1,050
Commercial buildings	13,720	55,863	5,852	48,112	12,626	16,844	153,017	1,048,322	5,825
Federal government	371	93	1,471	379	1,058	451	3,823	32,128	.....
Unclassified	217	8,117	6,132	648	11,302	1,272	27,688	224,967	1,064
August, 1927	$20,430	$83,025	$25,843	$73,773	$51,095	$35,178	$289,344	$2,044,973	$13,227
July, 1927	22,007	78,092	21,990	43,806	42,047	32,708	240,650	.....	5,849
August, 1926	17,977	76,648	19,767	65,070	38,393	25,161	243,016	.....	7,444
Jan. 1 to date, 1927	162,509	624,235	151,304	496,608	361,879	248,438	2,044,973	.....	76,415
Jan. 1 to date, 1926	155,170	592,967	202,271	469,832	289,102	192,708	1,902,122	.....	86,842

Delinquent Electrical Accounts

(Data Supplied by National Electrical Credit Association)

NUMBER OF ACCOUNTS REPORTED

Division	July 1926	July 1927	Per Cent Increase or Decrease	Seven Months 1926	Seven Months 1927	Per Cent Increase or Decrease
New York	339	232	−31.5	2,739	2,336	−14.7
Middle and Southern Atlantic	202	213	+5.45	1,385	1,194	−12.5
New England	89	177	+98.8	630	1,102	+74.9
Pacific Coast	16	18	+12.5	183	117	−36
Central	742	687	+8.06	6,380	6,530	+2.35
Total	1,388	1,427	+2.81	11,297	11,279	−0.16

TOTAL AMOUNTS REPORTED

	July 1926	July 1927	Per Cent Increase or Decrease	Seven Months 1926	Seven Months 1927	Per Cent Increase or Decrease
New York	$45,045	$52,475	+16.4	$401,775	$377,145	−6.13
Middle and Southern Atlantic	24,361	23,265	−4.50	148,483	146,055	−1.63
New England	8,750	24,083	+175.2	60,562	121,465	+100.5
Pacific Coast	2,113	2,740	+29.6	31,444	16,294	−48.1
Central	87,366	98,620	+2.58	693,924	760,115	+9.54
Total	$167,635	$201,183	+20	$1,336,188	$1,421,074	+6.35

AVERAGE AMOUNTS

	July 1926	July 1927	Seven Months 1926	Seven Months 1927
New York	$133	$226	$1,022	$1,143
Middle and Southern Atlantic	120	109	752	858
New England	98	136	686	771
Pacific Coast	132	152	1,103	1,840
Central	118	114	763	818

Bureau of Standards Issues More of Safety Code

That part of the National Electrical Safety Code dealing with the construction and maintenance of electrical supply and communication lines has been issued by the Bureau of Standards, Department of Commerce. Power lines, telephone and telegraph and other circuits are covered in this Handbook No. 10, which includes the rules relating to the construction and maintenance of overhead lines in order to insure the safety of the public and of workmen on these lines.

Market Conditions

MANY large power equipment orders were reported for transmission line equipment and power and generating equipment involving well over $1,000,000. No actual change is yet noted in business, although some sections report increased inquiries, but generally the belief is that a steady upturn in sales should be noted during the rest of the year.

In New England a large order for transmission line equipment was placed by the New England Public Service Company with the Westinghouse Electric & Manufacturing Company and amounted to more than $750,000. Motor sales are improving, and industrial heating equipment sales are active. Sales are quiet in the New York district, but the trade is optimistic. In the Southeast, although the volume of small orders has declined, some large power equipment contracts were closed. One from the Florida territory called for $200,000 worth of generating and power transformer equipment, and another from Mississippi covered $110,000 worth of power transformers. The only notable contract closed in the St. Louis district was for export and included three 2,000-kw. turbines, seven 300-hp. mill motors and other motors and switchboard and control mechanism for a 3,000-ton sugar mill. In the Middle West sales are seasonably slow, but a definite improvement is looked for this month. On the Pacific Coast the number of inquiries being received seems to presage good sales in September.

Metal Market Inactive—Prices Unchanged

Sales of all metals in the non-ferrous metal market were in only fair volume and well below current rates of production, but there is good reason to think that in the coming week much better business will be booked, particularly for copper, the market for which has been much below average for several weeks. Copper prices are virtually unchanged after another week with only a small volume of trading. Most producers continue to offer the metal at 13¼ cents delivered in the East and 13⅛ cents in the Middle West, with only an occasional sale of a small lot, though a respectable tonnage was sold in the Middle West on Tuesday. On the other hand, custom smelters are sellers at as low as 13⅛ cents and manage to get rid of enough to prevent their cutting prices further. The longer the large factors wait, the better their position will be, for scarcely any October copper has been bought, it would seem, and a fair amount of September requirements remain to be provided for.

The lead market still continues to decline, and the consumers have displayed little or no interest. There was a fair amount of business done on Sept. 3. One large seller is almost out of the market, but notwithstanding this, prices declined perceptibly. On Sept. 6 the American Smelting & Refining Company reduced its contract price from 6.50 cents to 6.40 cents, New York, but even this price has been shaded. Apparently the market is feeling the lack of any concerted action on the part of lead producers throughout the world to restrict output.

NEW YORK METAL MARKET PRICES

	Aug. 31, 1927 Cents per Pound	Sept. 7, 1927 Cents per Pound
Copper, electrolytic	13.15–13.20	13.15
Lead, Am. S. & R. price	6.50	6.40
Antimony	11⅛	11⅛–11⅜
Nickel, ingot	35	35
Zinc spots	6.625	6.60
Tin, Straits	63.625	64
Aluminum, 99 per cent	26	26

Base copper price Sept. 7, 1927, 15½ cents.

Large Transmission Order in New England

Outstanding in the business in the New England district has been an order placed by the New England Public Service Company, Augusta, Me., with the Westinghouse Electric & Manufacturing Company for upward of $750,000 worth of equipment, including 60,000 kva. of high-voltage transformers, twelve oil circuit breakers with ratings from 110,000 to 33,000 volts and associated equipment for installation in northern New England. The contract for that apparatus carries a bonus and penalty clause for rush delivery. Important development of interconnecting transmission lines in Maine is responsible for much of this activity, and provision for supplying power on a substantial scale to Maine and New Hampshire industries is included in the plans of these interests. In the motor field sales are improving somewhat, and recent purchases include a $25,000 consignment to a Massachusetts confectionery plant. It is reported that a Boston engineering house has purchased ten transformers, eight induction regulators and 200 distribution panels for use in the new Atlantic City convention hall, which is to be one of the largest in the United States.

Industrial heating equipment sales include a 45-kw. lead pot for a Portland newspaper and another for a Brockton daily. A Worcester factory has bought a 5-kw. air-tempering oven and a 12-kw.

heat-treating furnace. Domestic electric appliances are moving well, and one operating syndicate reported the sale last week of 351 home service devices, irons, percolators, portables and toasters being most active. The tone of general business improved perceptibly after the holiday.

Improvement Looked for in the Middle West

Sales in the electrical trade the past week reflect conditions generally prevalent at this season of the year. Vacation periods are nearly over and there is a general feeling that business will improve now that Labor Day is past. Power companies are continuing their construction programs and material for this work is moving evenly. Purchase of maintenance material is still much in evidence. The Cincinnati Traction Company has closed a contract with the Union Gas & Electric Company of the same city for the purchase of all its power needs. The General Electric Company has received the order for the necessary equipment, including eighteen automatic substations. The total cost of the work amounts to about $750,000. Considerable interest is evidenced among jobbers as to the possible effect which various refixturing programs to be launched during September may have on the demand for wiring supplies. Somewhat more life can be seen in the demand for appliances in anticipation of fall and the still somewhat distant holiday requirements.

Good Inquiries Noted on Pacific Coast

September business on the Pacific Coast promises well. Opening inquiries cover 200 35-ft. treated poles for a cement plant and 100 untreated 25-ft. poles for a dredging company. Each job includes the wire and hardware. Other inquiries cover a carload of 35,000-volt pin-type porcelain insulators valued at $6,500 for a power company and many smaller requisitions. It is rumored that two new fast cruisers will be built at Mare Island. Range sales are very good after a slow spring. The approach of the fall and holiday season is heralded by many sizable orders and inquiries for plugs, adapters, lamp cord and stand lamp clusters. The oil business is reported slow, but oil companies are buying rather heavily, one manufacturer reporting various orders for 35-hp. to 15-hp. drilling motors and one particular order for the 50-hp. to 20-hp. sizes, valued at $5,000. Other interesting orders covered two pumping motors for a power company for East Bay service and with transformers and incidentals totaling $40,000; a lot of disconnecting switches valued at $6,000 for northern California service, and two arc-welding sets valued at $3,000 for metal fabrication service in south San Francisco.

Specifications for the electrical equipment for the five-million-dollar 120-ton pulp-manufacturing plant and hemlock sawmill to be built in Tacoma by the Union Bag & Paper Corporation of New York and the St. Paul & Tacoma Lumber Company are being written in the East and are expected to be given to local electrical jobbers during this month. This is the third pulp mill under construction and planned for Tacoma. Sales reported in Seattle include a number of small motors. An order for twenty motors from 100 hp. down for a grain elevator in Cowlitz County is expected to be given this week. Sales of electric water heaters are reported excellent and on the increase.

Large Power Equipment Orders Placed in Southeast

While the volume of small orders for electrical equipment has declined in the Southeast, there are several outstanding individual large orders, the largest being from the Florida territory for approximately $200,000 worth of generating and power transformer equipment, while the next largest central-station order was from Mississippi for power transformers totaling $110,000. Other interesting central-station business covered two orders for high-tension substation equipment, one amounting to $16,000 and the other to $13,000, and an order for $7,100 worth of small disconnecting switches. Line-construction materials continue in reasonably satisfactory demand, one company placing orders for $7,600 worth of No. 6 weatherproof copper wire, creosoted pine poles amounting to $2,600 and insulators totaling $2,000. The demand for small transformers and house-type meters is well sustained, one company ordering within the past few days distribution and small power transformers aggregating $4,200 and 5-amp. and 10-amp meters totaling $2,600. Merchandising activities of power companies continue brisk, one of the smaller companies having recently closed a campaign of two weeks in which 450 flatirons were sold in the one town covered. The largest order received from the industrial field was for $100,000 worth of motors and incidental cement-plant equipment from the Tennessee territory, while Georgia was represented with two orders from textile plants for inside wiring materials, one amounting to $5,000, and the other to $3,000.

Sales Quiet in New York but Trade Optimistic

Sales of electrical equipment to public utility companies in the New York district continue generally quiet, although a slight improvement is shown in the position of distribution transformers and circuit breakers. Notwithstanding the prevalent dullness, several manufacturers hold an optimistic expectation that the latter part of this month will see an improvement in the situation. Sales of motors to industrial buyers are steady and of good volume in sizes below 10 hp., but the demand for larger size motors and control apparatus is poor. Jobbers' lines are somewhat spotty, but a fair amount of general buying is reported.

Large Export Order Placed in St. Louis District

There has apparently been a slight falling off of business actually placed in the St. Louis district. Although inquiries are being received about as usual, there seems to be a tendency to hold up shipments. The only notable contract closed was for export, and consists of three 2,000-kw. turbines, seven 300-hp. crusher and mill motors and smaller motors, with complete switchboard and control mechanism, all for equipment of a 3,000-ton sugar mill in the Philippine Islands. The ultimate daily capacity of this mill is to be 6,000 tons. The total contract price of the electrical apparatus is nearly $250,000. Another order worthy of mention was for a lot of motors for drainage pumps, amounting to $20,000. Jobbers report the volume of orders to be averaging approximately up to that of the last half of August.

Activities of the Trade

Five Radio Companies Merge as United States Electric

A merger of the Apex Electric Manufacturing Company and the Sentinel Manufacturing Company of Chicago, the Indiana Electric Manufacturing Company of Marion, Ind., the Slagle Radio Company of Fort Wayne, Ind., and the Workrite Manufacturing Company of Cleveland has been announced as the United States Electric Corporation. The merger was accompanied by incorporation under the laws of Delaware with 30,000 shares of no-par-value common stock. The new corporation is licensed under all radio-receiving-set patents of the Radio Corporation of America (except super-heterodyne patents), as well as the patents of the American Telephone & Telegraph Company, the Westinghouse Electric & Manufacturing Company, the General Electric Company, the Hazeltine Corporation, the Latour Corporation and the Technidyne Corporation. The officers and directors of the new company are Allen G. Messick, president; Carl D. Boyd, first vice-president; P. K. Romey, secretary, and John Beatty, treasurer. The three operating vice-presidents, who are also directors of the company, are A. E. Case, V. H. Meyer and L. S. Slagle.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has been awarded the contract for the transformers, induction regulators, switching apparatus and other electrical equipment for the new municipal convention hall being erected at Atlantic City, N. J.

THE EARLE GEAR & MACHINE COMPANY, 4707 Stenton Avenue, Philadelphia, announces the opening of a district office in New York City at 95 Liberty Street. C. N. Walsh and George E. Barrett are in charge. The company also maintains a district office at 110 State Street, Boston, in charge of William H. Allen.

THE CORNING GLASS WORKS, Corning, N. Y., announce that Glenn A. Briggs has been appointed Chicago representative to handle the sales of "Pyrex" power insulators in the Middle West territory.

THE LINCOLN ELECTRIC COMPANY, Cleveland, manufacturer of "Linc-Weld" motors and "Stable-Arc" welders, announces the removal of the northern California office of the Wade Engineering Company, which handles Lincoln products, from 69 Webster Street, Oakland, to new and larger quarters at 533 Market Street, San Francisco.

THE TRUSCON STEEL COMPANY, Youngstown, Ohio, manufacturer of steel poles, building and pole-line hardware, etc., according to an announcement of Julius Hahn, president, will begin operations about Sept. 15 at the Los Angeles plant, which has been under construction and is nearly completed.

THE PALMER ELECTRIC & MANUFACTURING COMPANY, 175 Fifth Street, Cambridge, Mass., manufacturer of meter-service switches, etc., announces the removal of its factory from Cambridge to new and larger quarters at Waltham, Mass., where twice the floor space is now available. The company reports a very successful business for the first two quarters of 1927.

THE SILVRAY COMPANY, INC., 55 West Sixteenth Street, New York, N. Y., announces the appointment of the Philadelphia Daylight Company, Bourse Building, Philadelphia, as distributor of Silvray products in the Philadelphia territory. The company also announces the bringing out of a new operating-room light for hospitals.

THE RAILWAY & INDUSTRIAL ENGINEERING COMPANY, Greensburg, Pa., manufacturer of transmission switching and protective equipment, announces the removal of its New York district office to the Park-Murray Building, 11 Park Place. N. F. Harrington is district manager.

THE ALLEN-BRADLEY COMPANY, Milwaukee, manufacturer of electric control apparatus, announces the appointment of Robbins & Robbins, 801 Tchoupitoulas Street, New Orleans, as its representatives in the New Orleans territory, including southern Louisiana, Mississippi and the southwest corner of Alabama. The company also announces the appointment of W. O. Taylor & Company, Ltd., 415 Canada Cement Building, Montreal, Canada, as representatives in the Montreal territory, including the major portion of Quebec and the eastern part of Ontario as far west as Kingston.

THE AMERICAN ELECTRICAL WORKS, Phillipsdale, R. I., manufacturers of electric cable and wires, have awarded a general contract to the Austin Company, 120 Broadway, New York, for a new addition to their plant.

THE FALK CORPORATION, Milwaukee, manufacturer of herringbone gears, speed reducers, flexible couplings, oil engines and steel castings, announces the opening of an office in Portland, Ore., at 729 Terminal Sales Building, Twelfth and Morrison Streets, in charge of John Jurgensen, who has been in the company's New York office for seven years.

THE COOK PORCELAIN INSULATOR CORPORATION, Cambridge, Ohio, manufacturer of high-tension insulators, announces the appointment of Barkley, Bauder & Close, 10 High Street, Boston, as its New England sales representatives.

THE ARTISTIC LIGHTING EQUIPMENT ASSOCIATION, Graybar Building, 420 Lexington Avenue, New York City, announces that illuminated house numbers are now available in different styles and forms to meet all requirements.

THE JEFFERY-DEWITT INSULATOR CORPORATION, Kenova, W. Va., announces the appointment of the Garland-Affolter Engineering Corporation, with offices in the Alaska Building, Seattle, as representative in the Pacific Northwest. The Garland company has been representing the Jeffery-DeWitt interests in California for some time.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has received a contract from the Inter-Island Steamship Company, a subsidiary of the Matson Navigation Company, San Francisco, to manufacture two 2,000-hp. complete expansion turbines, together with double-reduction gear units, for installation in a twin-screw passenger and freight steamship. The company will also furnish two 100-kw. turbo-generator sets for auxiliary power and light service, as well as two main and one auxiliary surface condenser with their auxiliaries.

THE BAKER R. & L. COMPANY, Cleveland, has received an order from the First National Stores, Inc., Boston, for eight 6,000-lb. industrial electric trucks, low-lift elevating-platform type, for use in a new electrically equipped bakery at Somerville, Mass. These trucks will be equipped with Edison cells.

THE NATIONAL CARBON COMPANY, 30 East Forty-second Street, New York City, announces the removal of its Seattle office from the L. C. Smith Building to 2901 First Avenue, South.

THE AMERICAN ENGINEERING COMPANY, Philadelphia, manufacturer of the "Taylor" stoker, "Lo-Hed" electric hoists, etc., announces the appointment of R. H. McGredy as sales manager of its "Lo-Hed" electric hoist division.

THE PACKARD ELECTRIC COMPANY, Warren, Ohio, manufacturer of transformers and automotive cables, announces the opening of a branch office at 1700 Walnut Street, Philadelphia. This office will be in charge of Ezra H. Day, who has been associated with the Engineering Equipment Company of Philadelphia and had previously sold Packard transformers in the capacity of sales agent when he was associated with Joseph H. Manypenny.

THE GENERAL ELECTRIC COMPANY has taken out a permit for the erection of a one-story addition to its plant on Elmwood Avenue, Philadelphia to be 140 ft. x 554 ft.

THE ROME WIRE COMPANY, Rome, N. Y., recently held its annual sales conference at the mills at Buffalo and Rome. The session was directed by C. R. Keeney, vice-president in charge of sales. The four-day meeting comprised plant inspection, discussion of sales methods and production problems. Several new products were announced.

THE DELTA-STAR ELECTRIC COMPANY, 2400 Block, Fulton Street, Chicago, manufacturer of high-tension equipment, has purchased the Electric Connector Company of Minneapolis, manufacturer of solderless rigid-stud compression connectors. These connectors will now be made in the Chicago factory and the company states that the line will be greatly extended.

THE WARD LEONARD ELECTRIC COMPANY, 31 South Street, Mount Vernon, N. Y., manufacturer of rheostats and other control equipment, announces that C. E. Wise, who represents the company in the Detroit district, has admitted Leroy Braisted as a partner in the firm, which will hereafter be known as Wise & Braisted. The address is 2-133 General Motors Building, Detroit.

THE RILEY STOKER CORPORATION, Worcester, Mass., announces that E. H. Schmitz has been appointed district manager of the Pittsburgh office. Mr. Schmitz has been with the Riley corporation since 1925 and has been devoting his time to experimental developments and tests.

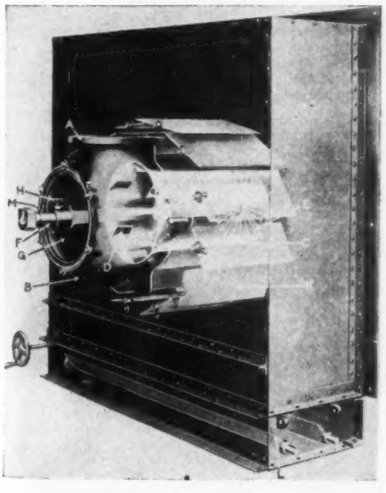
THE MID-WEST METAL PRODUCTS COMPANY, Second and Pierce Streets, Muncie, Ind., is now offering to the electrical trade a new combination product consisting of "Kruse" switch-box supporting strips and "Mansfield" switch boxes with lath holders attached.

THE AIR-WAY ELECTRIC APPLIANCE COMPANY, 618 Broadway, Toledo, Ohio, is now in its new factory, which gives it 100 per cent more floor space. With the new factory in operation the plant will have a capacity of 1,200 Air-Way cleaners per day.

New Equipment Available

Flare-Type Pulverized-Coal Burner

In a new flare-type pulverized-coal burner placed on the market by the Riley Stoker Corporation, Worcester, Mass., pulverized coal, carried in suspension by the primary or conveying air, enters the chamber *B* through the flanged connection *A*, as shown in the illustration. The stream is given a circular motion within the chamber and enters the pipe *C* while revolving about the axis of the pipe. Since this motion tends to cause the coal stream to travel in a zone adjacent to the inner surface of the pipe, the vanes *D* are arranged to divert the stream toward the center. The coal then passes to the tip of the pipe, completely filling the space between the pipes *F* and *C*. The vanes *E* break the coal streams into a number of stratified streams and divert these strata into a conical form or flare. Secondary air, supplied under pressure from a fan, passes the dampers *L*, which control the quantity of air flowing, and is given a whirling motion in passing between the vanes *K*. The amount of whirl is determined by the position of these vanes. In general the direction of rotation of the secondary air is opposite to that of the primary air and coal in the chamber *B* and pipe *C*, but the vanes have been so designed and constructed that the secondary air may be

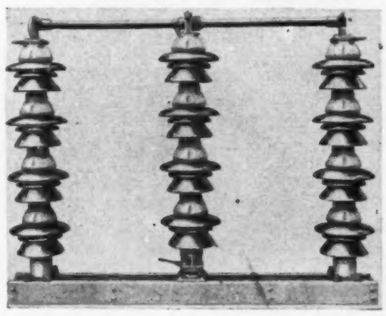


PULVERIZED-COAL FLARE-TYPE BURNER

introduced in a direction the same as that of the primary air and coal.

Mixing of secondary air with primary air and coal occurs beyond the tip of the burner *E*. The coal stream issuing from the tip *E* in the form of a flare is violently whipped by the stream of secondary air issuing through the vanes *K*, the two streams being in rapid rotation. Impingement of the coal stream on the vanes *E* results in layers consisting of alternate rich and lean mixtures of coal and air. The rich portions of the stream ignite readily and act as kindling to the remainder of the mixture. Initial ignition is secured by means of a kerosene torch. The degree of the flame is adjusted by advancing or retarding the pipe *F* and rosette *E*. When this burner is used in connection with the Riley "Atrita" unit pulverizer, the range of load which can be carried is shown in the example of one plant in which the load varies from 200 hp. to 1,300 hp. and in another from 400 hp. to 2,800 hp., with satisfactory operating results and performance in both cases.

Gang-Operated Disconnecting Switch



TYPE "TTT HI-PRESSURE" CONTACTOR SWITCH FOR 154-KV. SERVICE

The type "TTT" horizontal-opening, gang-operated "Hi-Pressure" contact disconnecting switch, built for all voltages up to and including 220,000 and in capacities up to 2,000 amp., has been placed on the market by the Railway & Industrial Engineering Company, Greensburg, Pa. In closing, the blade swings into the jaw opening and comes to rest against a stop. The high-pressure contact is made by the rotating of the blade into chrome-steel-reinforced jaws by the final movement of the operating handle. This rotating movement is said to prevent corrosion from the contact surfaces and to reduce the contact resistance. The rotating insulator column is supported on double Timken bearings which are Alemite-lubricated. A sleet hood is regularly furnished for the mechanism on the rotating insulator.

Four New Elevator Control Devices Developed

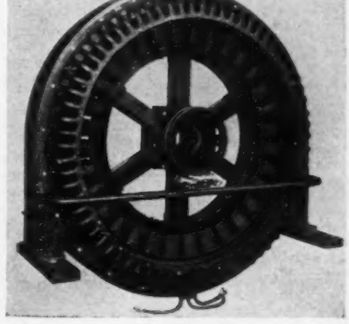
Four new elevator control devices developed by the General Electric Company include a definite time relay, a weight-return car switch for high-speed elevators, a car switch for low-speed elevators and a slow-down and stop limit switch for terminal landings. The definite time relay embodies the inertia principle and provides for the acceleration and retardation of an elevator on a definite time basis. The relay makes provision for a time interval in opening as well as in closing, thus allowing the same relay to control the retardation as well as the acceleration sequence if desired. The relay is adjustable for time settings of any value between ½ second and 1½ seconds. The new weight return car switch for high-speed elevators handles the control circuits without excessive arcing, rotates smoothly and with little effort and positively returns and locks in the "off" position when released by the operator.

The car switch for low-speed elevators provides a locked "off" position, either one or two points of speed control in either direction and, with slight changes in the device, either flush, open or pedestal mounting. The slow-down and stop limit switch for terminal landings is mounted on top of the elevator car and operated by stationary cams in the hatchway. Five points of automatic slow-down and one point "stop" are provided in either direction of travel, each point having an individual micrometer adjustment throughout a wide range.

Synchronous Motor of Arc-Welded Construction

A new low-speed synchronous motor, called the type "HR," has been placed on the market by the Westinghouse Electric & Manufacturing Company. The company states that while arc welding has been used to some extent in its motors for fifteen years, it reaches its greatest application in this synchronous motor. This motor has been designed for high efficiency at all loads that come within its normal operating range.

A starting torque of 50 per cent and a pull-in torque of 40 per cent are



TYPE "HR" LOW-SPEED ARC-WELDED SYNCHRONOUS MOTOR

characteristic of this new motor. A means of varying the flywheel effect is provided by means of different weight rings bolted to the rotor rim. Six possible values of flywheel effect are available. The shape of the rotor arms is such that a large amount of the air is set in motion. This cooling air is so directed that it not only passes through the stator coils but also over a large area of the laminations of the stator.

Electrical Patents

Announced by U. S. Patent Office

(Issued Aug. 16, 1927)

1,639,125. ELECTRICAL CONNECTER DEVICE; R. B. Benjamin, Chicago, Ill. App. filed June 23, 1921. For electrically connecting and supporting a fixture in position with respect to a receptacle.

1,639,157. TRAFFIC-GATE STRUCTURE; M. H. Alberts, Battle Creek, Mich. App. filed Feb. 1, 1926. Trolley bridge having features of construction to prevent disengagement of the trolley.

1,639,161. TERMINAL; E. A. Bohlman, Chicago, Ill. App. filed June 2, 1921. Connection terminal with clamping means for securely holding a conductor or connector.

1,639,188. PROCESS FOR THE PRODUCTION OF ELECTRODES; E. Kleinschmidt, Frankfort-on-the-Main, Germany. App. filed Nov. 21, 1925. Reduces an agglutinant to an impalpable powder and admixes such powder to the raw material from which the electrodes are to be formed.

1,639,196, 1,639,197. ELECTRIC SWITCH; T. A. Pangburn, Camden, N. J. Apps. filed Dec. 2, 1921. Alarm switch.

1,639,258. ELECTRICAL DEVICE AND THE MANUFACTURE THEREOF; J. H. Cohen, Bridgeport, Conn. App. filed Aug. 14, 1924. Heating units for cigar-lighters of the 6-volt type.

1,639,280. STORAGE CELL AND ELECTRODE THEREFOR; R. C. Benner, Bayside, N. Y., and H. F. French, Flushing, N. Y. App. filed Aug. 11, 1922.

1,639,310. ELECTRICAL CONNECTING UNIT; H. F. Richardson, Brooklyn, N. Y. App. filed Jan. 7, 1922. For use in connection with annunciator systems.

1,639,338. CAR-HEATING SYSTEM; E. H. Gold, Chicago, Ill. App. filed June 20, 1925.

1,639,340. COMBINATION INDUCTION FURNACE; A. E. Greene, Seattle, Wash. App. filed Jan. 3, 1913. Combination transformer and induction furnaces.

1,639,374. THERMOSTATIC SWITCH FOR INCUBATORS; A. M. Goldberg, Indianapolis, Ind. App. filed Aug. 28, 1922.

1,639,382. ELECTRIC HEATING ELEMENT; F. W. Moffat, Weston, Ontario, Canada. App. filed June 8, 1926. For cooking tops of electric ranges.

1,639,432. FIXTURE HANGER; G. B. Hoobler, Norwood, Ohio. App. filed Aug. 18, 1925.

1,639,437. ELECTRICAL CONNECTER SOCKET OF THE WALL AND PLUG TYPE; M. G. Saenz, Colonia Postal, General Anaya, Mexico. App. filed Aug. 6, 1925.

1,639,457. ELECTRODE; A. Kirkaldy, New York, N. Y. App. filed Nov. 13, 1925. Such as are employed in electrolytic systems for the protection of containers such as boilers, condensers and the like.

1,639,465. ELECTRICAL CIGAR LIGHTER; H. Overen, Seattle, Wash. App. filed March 3, 1925.

1,639,473. ELECTRIC POWER TRANSMISSION; A. M. Taylor, Erdington, Birmingham, England. App. filed Sept. 27, 1926. The combination of a cable comprising concentric insulated conducting cores, means to transmit current through the cable and means to increase the proportion of the current carried by the outer core or cores with the increase of load on the cable.

1,639,496. OUTLET BOX SUPPORT; H. Ginsburg, New York, N. Y. App. filed Feb. 20, 1926.

1,639,508. LIGHTING FIXTURE; W. R. Kahns and K. Keller, Brooklyn, N. Y. App. filed May 20, 1926.

1,639,527. CONDUCTOR SUPPORT; W. S. Mayer, Philadelphia, Pa. App. filed April 10, 1924. For trolley wires.

1,639,533. ELECTRIC SWITCH; A. R. Rice, Toronto, Ontario, Canada. App. filed Jan. 28, 1925. Pull-chain mechanism which may be readily mounted in the smallest size of shell of the chandelier type of switch now used.

1,639,541. ELECTRIC FITTING; W. A. Stacey, Chicago, Ill. App. filed June 9, 1924. Plug fitting adapted for co-operation with an outlet receptacle of the T-slot type.

1,639,569. MANHOLE SWITCH; P. W. Koch, Chicago, Ill. App. filed April 14, 1924.

1,639,575. SEAL, JOINT AND THE LIKE OF VACUUM CONTAINERS; E. Y. Robinson, Manchester, England. App. filed Aug. 20, 1923.

1,639,578. HOLD-UP ALARM; S. Steinhardt, New York, N. Y. App. filed July 3, 1926.

1,639,581. PIVOTED-CLOSURE OPERATING MEANS AND CIRCUIT CLOSER; J. E. Vaughn, Los Angeles, Cal. App. filed Oct. 8, 1923.

(Issued Aug. 23, 1927)

16,715, 16,716 (reissue). ELECTRIC WATER HEATER; S. D. Nesmith, San Diego, Cal. Apps. filed Oct. 8, 1923, and May 11, 1926.

1,639,650. HIGH-POTENTIAL CONDENSER; W. Dubilier, New York, N. Y. App. filed March 7, 1919.

1,639,653. METHOD OF AND APPARATUS FOR WELDING METAL STRANDS; J. W. Fay, Villa Park, Ill., and C. Wales, La Grange, Ill. App. filed Aug. 22, 1923.

1,639,655. THERMOSTATICALLY CONTROLLED ELECTRIC SWITCH; C. M. Holley, Highland Park, Mich. App. filed Feb. 23, 1922.

1,639,688. WELDING TOOL; G. W. Duncan, Chicago, Ill. App. filed Nov. 10, 1925. For welding metal strands.

1,639,691. CLOCK-WINDING MECHANISM; A. W. Fowler, Collinsville, Ill. App. filed Aug. 16, 1926.

1,639,701. LAMP; C. W. Meehan, Pittsburgh, Pa. App. filed Aug. 29, 1925. Floor lamp for hotels, clubs, lodge rooms, etc.

1,639,728. INDUCTION ELECTRICITY METER; J. Harris, Lafayette, Ind. App. filed Jan. 25, 1926. Watt-hour meter.

1,639,753. HAIR DRIER AND THERAPEUTIC LAMP; W. G. Shelton, New York, N. Y. App. filed Nov. 28, 1925.

1,639,820. METHODS OF AND APPARATUS FOR PROTECTING AERIAL CABLES; T. Varney, Sewickley, Pa. App. filed Sept. 16, 1924.

1,639,888. THERMOSTATIC SWITCH; W. J. Hawkins, Montclair, N. J. App. filed Dec. 12, 1919. For refrigerating machinery.

1,639,901. ORGAN RELAY; M. H. Sampson, Chicago, Ill. App. filed July 23, 1923.

1,639,953. STEAM GENERATOR; P. J. Miller, Peoria, Ill. App. filed Dec. 9, 1925.

1,639,965. ALARM GAGE; W. F. Priest, Somerville, Mass. App. filed May 2, 1925.

1,639,980. ELECTROCHEMICAL PRODUCTION OF SOLID OXIDES OF CARBON; B. K. Brown, Terre Haute, Ind. App. filed July 7, 1925.

1,639,981. PRODUCING OXIDIZED CARBON; O. W. Storey and G. T. Collinson, Madison, Wis. App. filed July 7, 1925.

1,639,982. PRODUCING SOLID OXIDES OF CARBON; O. W. Storey, Madison, Wis. App. filed July 7, 1925.

1,639,983, 1,639,984. GALVANIC CELL; B. K. Brown, Terre Haute, Ind. Apps. filed July 7, 1925.

1,639,985. DRY-CELL DEPOLARIZER; B. K. Brown, Terre Haute, Ind. App. filed July 7, 1925.

1,639,987. ELECTRICAL CONTROL SYSTEM (granted under the Act of March 3, 1883); R. C. Coupland, U. S. Army, Dayton, Ohio. App. filed May 13, 1926. Applicable to radio control of torpedoes, bombs, ships and other self-propelled dirigible bodies.

1,639,990. ELECTRIC CLOCK-WINDING MECHANISM; F. A. Feldkamp, Newark, N. J. App. filed Dec. 23, 1925.

1,640,002. SPEED REGULATOR FOR HIGH-FREQUENCY GENERATING SETS; M. Latour, Paris, France. App. filed May 17, 1923.

1,640,039. BATTERY CELL; F. A. Keller, New York, N. Y. App. filed March 17, 1925.

1,640,047, 1,640,048, 1,640,049. ELECTRIC WATER HEATERS; S. D. Nesmith, San Diego, Cal. Apps. filed Aug. 26, 1924, and May 19 and May 22, 1926.

1,640,061. CLAMPING ELECTRODE; R. H. Wappler, Yonkers, N. Y. App. filed July 2, 1924.

1,640,086. MOTOR-CONTROL MECHANISM; C. H. McCullough, Visalia, Cal. App. filed Dec. 12, 1925. Manually controlled automatic motor starting and controlling mechanism, adapted to operate a field rheostat for an electric motor.

1,640,119. ELECTRIC ACCUMULATOR FOR HANDLAMPS; C. R. Fowler and E. M. Roberts, Bulli, New South Wales, Australia. App. filed Sept. 25, 1925.

1,640,128. EXPANDING PLUG; L. R. Kovanda, Los Angeles, Cal. App. filed Sept. 20, 1922. For connecting portable electrical devices into an electrical circuit.

1,640,170. STREET-TRAFFIC SIGNAL DEVICE; J. E. Wright, New York, N. Y. App. filed July 12, 1922.

1,640,177. ELECTRICAL REVERSING DEVICE FOR TAPPING MACHINES; B. S. Bishop, Shrewsbury, Mass., and P. E. Dow, Leicester, Mass. App. filed Jan. 13, 1926.

1,640,226. TIPLESS LAMP AND METHOD OF MAKING SAME; J. S. Wheeler, Guelph, Ontario, Canada. App. filed July 2, 1923.

1,640,244. ELECTRIC WELDING APPARATUS; F. P. McBerty, Warren, Ohio. App. filed July 20, 1921.

1,640,254. AUTOMATIC ALARM FOR SATCHELS; E. F. Scales, Danville, Va. App. filed Nov. 6, 1925.

1,640,257. THERMOSTATIC SWITCH; E. Stranszky, Warren, Pa. App. filed Dec. 8, 1921.

1,640,286. SIGNALING MECHANISM; R. A. Neuschotz, New York, N. Y. App. filed May 9, 1925. For elevator signaling.

1,640,300. THERMOSTATIC SAFETY SWITCH OR CUT-OUT; P. Strughold, St. Louis, Mo. App. filed Sept. 14, 1926.

1,640,304. TROLLEY-WHEEL RETAINER; H. G. Winter, Pittsburgh, Pa. App. filed Aug. 31, 1926.

1,640,309, 1,640,310. PROTECTIVE SYSTEM FOR ELECTRIC APPARATUS; M. Buchholz, Cassel, Germany. Apps. filed April 16 and April 6, 1925. Operating in an insulating medium, such as oil transformers, oil switches, etc.

1,640,321, 1,640,322, 1,640,323. STARTING SYSTEM FOR SYNCHRONOUS MOTORS; C. T. Hibbard, Minneapolis, Minn. Apps. filed July 19, 1924, Jan. 17, 1920, and May 15, 1923. Automatic.

1,640,325. MESSENGER-CALL CIRCUITS AND SWITCHING APPARATUS THEREFOR; G. W. Janson, Nutley, N. J. App. filed Sept. 26, 1925.

New Trade Literature

CONSTANT-CURRENT TRANSFORMERS.—Bulletin GEA-769 issued by the General Electric Company, Schenectady, N. Y., covers the "Novalux" constant-current transformers, non-automatic station type RV and automatic station type RF. The company is also distributing bulletin GEA-798, describing the "Novalux" ornamental units, form 27.

SMALL POWER TRANSFORMERS.—A leaflet, No. 20,331, issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., describes and illustrates the "type OISC" single-phase, platform-mounting transformers for from 2,300 volts to 66,000 volts, ranging in capacity from 201 kva. to 500 kva.

DIESEL ENGINES.—The Bethlehem Steel Company, Bethlehem, Pa., has issued catalog F, entitled "Bethlehem Diesel Engines, Type S," in which it describes and illustrates the two-cycle airless injection type for stationary service.

ACROSS-THE-LINE STARTER.—A leaflet issued by the Square D Company, Detroit, describes and illustrates its automatic across-the-line starter with push-button control.

STEEL-MILL MAIN-ROLL DRIVES.—The General Electric Company, Schenectady, N. Y., is distributing bulletin GEA-790, covering the General Electric direct-current motors for steel-mill main-roll drives.

GUY WIRE PROTECTOR AND GUY ANCHOR.—Two booklets issued by the Specialty Device Company, 106 West Third Street, Cincinnati, describe respectively the "Bierce" guy wire protector and the "Bierce" guy anchor.

DISTRIBUTION TRANSFORMERS.—A leaflet, No. 20,330, issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., describes and illustrates the application and construction of the "type SC" steel-clad, single-phase, platform-mounting distribution transformers for use with 33,000, 44,000 and 66,000-volt systems on capacities less than 200 kva.

CONTROL EQUIPMENT.—The Industrial Controller Company, Milwaukee, has issued a catalog describing its semi-automatic and fully automatic control for skip hoists. Dimension diagrams of the various types are included.

OIL DISCONNECTS.—The G. & W. Electric Specialty Company, 7780 Dante Avenue, Chicago, has issued bulletin No. 273, illustrating and giving information on the G. & W. vault unit, automatic operating mechanism and a line of oil and air-break disconnects.

FLEXIBLE METAL HOSE.—Charles Cory & Son, Inc., 183 Varick Street, New York City, have issued bulletin No. 201-29-C, containing illustrations, data and descriptions of seamless flexible metal hose.